THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXVIII. No. 1747.] LONDON, NOVEMBER 3, 1896. [48TH YEAR. PRICE 6d.

TUBES AND FITTINGS
FOR
GAS, STEAM, WATER,
AND ALL PURPOSES,
ALSO
COILS OF EVERY SIZE AND SHAPE.

Apply to the Original Firm of
JOHN BROTHERTON
LIMITED,
Imperial Tube Works, Monmore Green,
WOLVERHAMPTON.
ESTABLISHED 1861.

Lanemark Coal Co.,
LIMITED.
LANEMARK CANNEL AND GAS COALS.
Quotations and Analysis on Application to
LANEMARK COLLIERY,
NEW CUMNOCK, N.B.
Shipping Ports: All the principal Scotch Ports.

— ESTABLISHED 1830. —
PARKER & LESTER,
Manufacturers & Contractors.
THE ONLY MAKERS OF
PATENT ANTIMONY PAINT,
Parker's Imperial Black Varnish,
Oxide Paints, Oils, and General Stores for Gas and Water Works.
WORKS:
ORMSIDE STREET, OLD KENT ROAD,
LONDON.

ROBERT MARSHALL,
CANNEL COAL MERCHANT,
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Prices and Analysis of all the Scotch Cannels on Application.

CARLESS, CAPEL & LEONARD,
HOPE CHEMICAL WORKS, HACKNEY WICK, LONDON, N.E.,
And at Pharos Works, Hackney Wick.
NAPHTHA AND GASOLINE DISTILLERS AND PETROLEUM IMPORTERS,
Specially distil Carburine Spirit, specific gravity ·680, or of any other grade suitable for Enriching Gas; also Gas Oil best adapted for injecting into the Retorts, as in the Herring Process.
Importers of Petroleum for Carburetting Water Gas, or for Manufacturing Oil Gas. Distillers of Pentane, Petroleum Ether, and Naphtha for clearing the pipes of Naphthaline, &c.
Samples and Prices may be had on application.

WHAT IS THE "MELDRUM" DUST-FUEL FURNACE?
MANY HUNDREDS WORKING AT GAS-WORKS.
Write for Catalogue—
MELDRUM BROS., ATLANTIC WORKS, MANCHESTER.
Also at LONDON, LEEDS, NEWCASTLE, LIVERPOOL, and BIRMINGHAM.

DANIEL HOWARD,

(Successor to the late BENJ. WHITEHOUSE),

GASHOLDER & BOILER WORKS,

WEST BROMWICH, NEAR BIRMINGHAM

(ESTABLISHED 1765).

MANUFACTURER OF TELESCOPIC AND SINGLE GASHOLDERS,

WROUGHT AND CAST IRON TANKS FOR DITTO,

PURIFIERS, CONDENSERS, SCRUBBERS, HYDRAULIC MAINS, and all kinds of GAS APPARATUS,

Wrought-Iron Roofs, Bridges, Girders, &c.,

Steam, Hot Water, and Range Boilers, Tanks, Cisterns, Boats, and all kinds of Wrought-Iron Work.

DRAWINGS, SPECIFICATIONS, AND ESTIMATES SUPPLIED ON APPLICATION.

EDWARD COCKEY & SONS, Ltd.,

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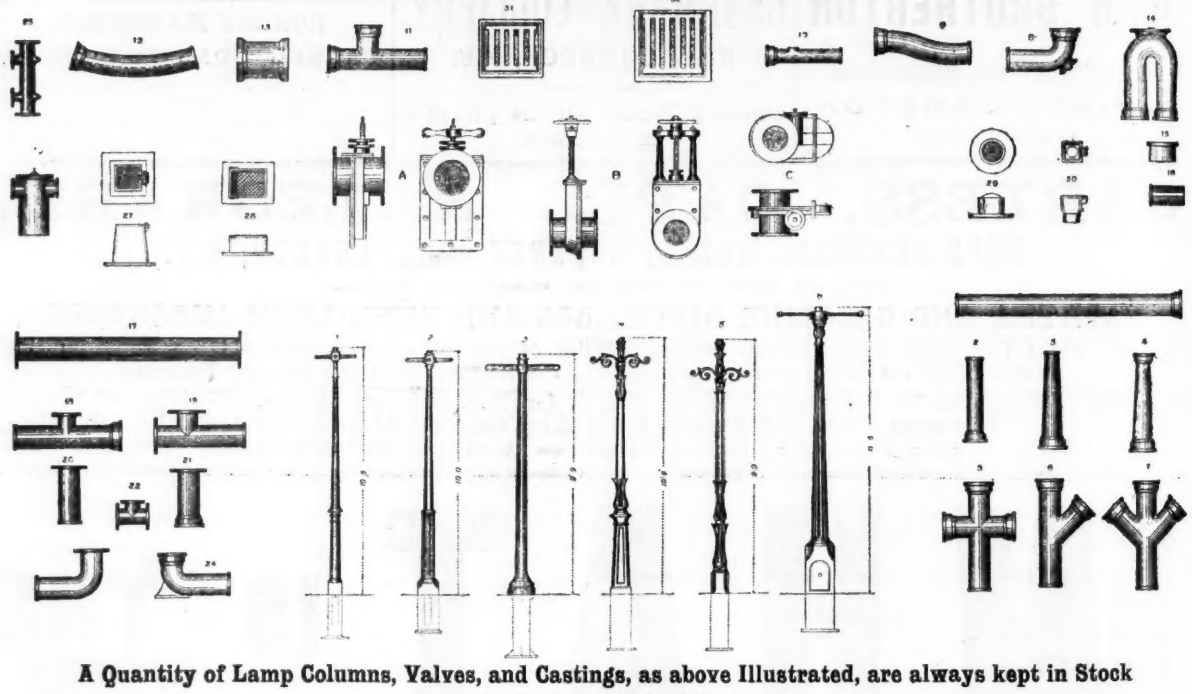
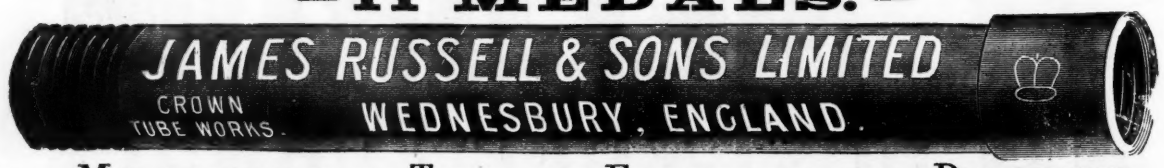
FROME, SOMERSET.



A Quantity of Lamp Columns, Valves, and Castings, as above Illustrated, are always kept in Stock ready for immediate delivery.

HIGHEST AWARDS—LONDON, PARIS, COLOGNE, VIENNA, MELBOURNE, AND OTHERS.

—11 MEDALS.—



MANUFACTURERS OF TUBES AND FITTINGS OF EVERY DESCRIPTION.

WROUGHT-IRON OR STEEL MAINS UP TO 6 FEET DIAMETER, FOR GAS, WATER, OIL, OR OTHER PURPOSES.

SCREWING TACKLE, BOILER MOUNTINGS, VALVES, COCKS, ETC.

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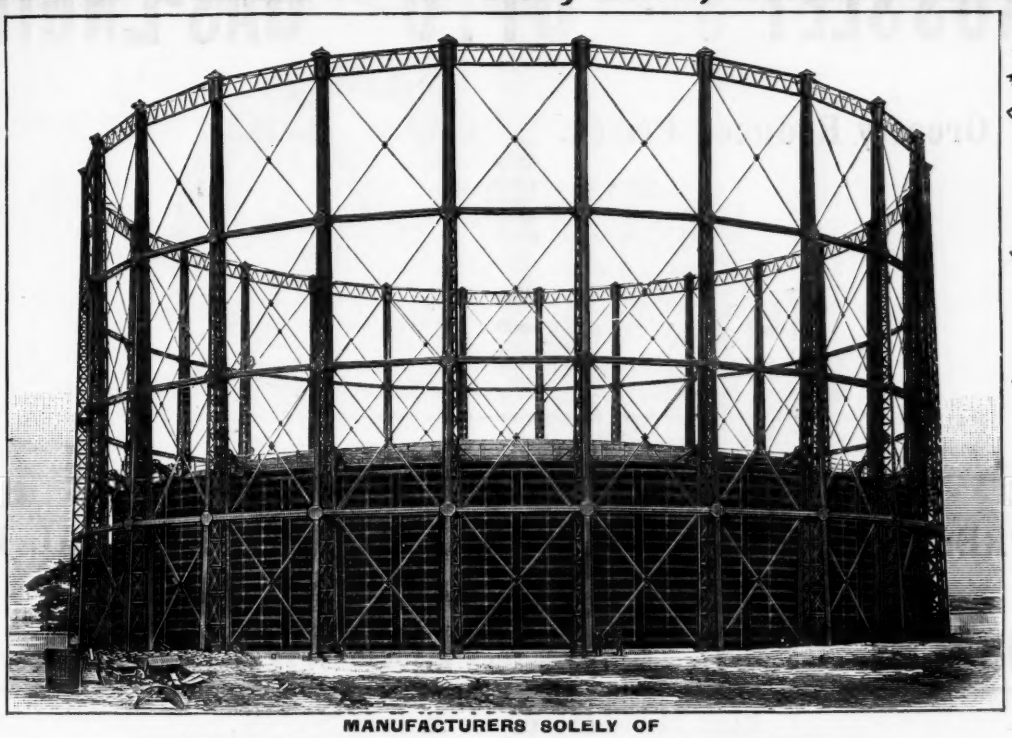
GAS PLANTS, BOILERS, ENGINES, PUMPS, ROOFS, RETORT FITTINGS, ETC.



TELEGRAPHIC ADDRESS: ATLAS BIRMINGHAM.

WELDED & RIVETED PIPES. FOUL MAINS. RETORT LIDS, WROT & CAST TANKS. PURIFIERS.

MANUFACTURERS SOLELY OF

HUMPHREYS & GLASGOW'S

PATENT CARBURETTED WATER-GAS PLANT.

INSTALLATIONS have already been supplied, and are in operation at the following Gas-Works: COPENHAGEN, BELFAST, GLASGOW, BRUSSELS, SANTIAGO, SWANSEA, TOTTENHAM, LIVERPOOL, BRIGHTON, BATH, PRESTON, SOUTHPORT, NEW YORK, NEWBURGH (N.Y.), LEA BRIDGE, NEWBURGH (Second Contract), COVENTRY; and are in course of erection at: BELFAST (Second Contract), EDINBURGH, TOTTENHAM, WINCHESTER, HOYLAKE, MANCHESTER, BRUSSELS (Second Contract), ST. JOSEPH (MO.), HOLYOKE (MASS.), SHANGHAI, STOCKTON, STOCKPORT, NORWICH, GUILDFORD, SYRACUSE, BORDENTOWN.

All Particulars from Patentees: 9, VICTORIA STREET, LONDON, S.W.

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THORNCLIFFE IRON-WORKS, near SHEFFIELD,

MANUFACTURERS OF

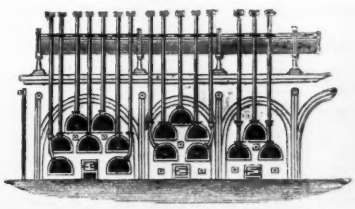
SLIDE VALVES, WITH RACK & PINION OR Internal or External SCREWS of all sizes.

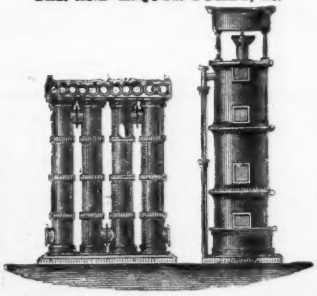
GASHOLDERS, AND Gasholder Tanks.

CAST-IRON RETORTS, RETORT-BED FITTINGS, *And Retort-House Appliances* of every description, Iron Roofs, Columns, Girders, Floor Plates, Tools, &c.

WROUGHT AND CAST IRON CONDENSERS, SCRUBBERS, & WASHERS, TAR AND LIQUOR PUMPS, &c.

PATENT CENTRE-VALVES for working Purifiers, Also Bye-Pass & Stop Valves





PURIFIERS with Planed Joints, HAND and HYDRAULIC LIFTING GEAR, CAST-IRON MAINS, and SPECIALS.

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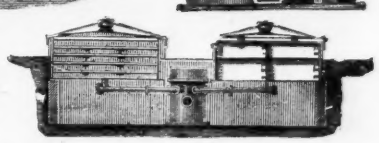


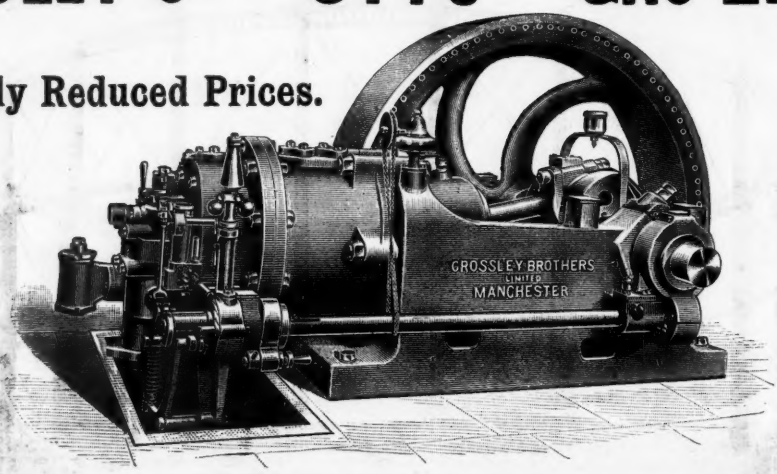
DESIGNS, SPECIFICATIONS, AND ESTIMATES FREE.

Pig Iron (*Special Quality*) for ENGINE CYLINDERS, &c.

GAS COAL FAMOUS FOR ITS UNRIVALLED EXCELLENCE.

CROSSLEY'S "OTTO" GAS-ENGINES

Greatly Reduced Prices.



REPRESENTS NEW TYPE 40-HORSE POWER NOMINAL HIGH-SPEED ELECTRIC-LIGHT ENGINE.

CROSSLEY BROS., LTD., OPENSHAW, MANCHESTER.

HARRIS & PEARSON,

STOURBRIDGE, ENGLAND

MANUFACTURERS OF

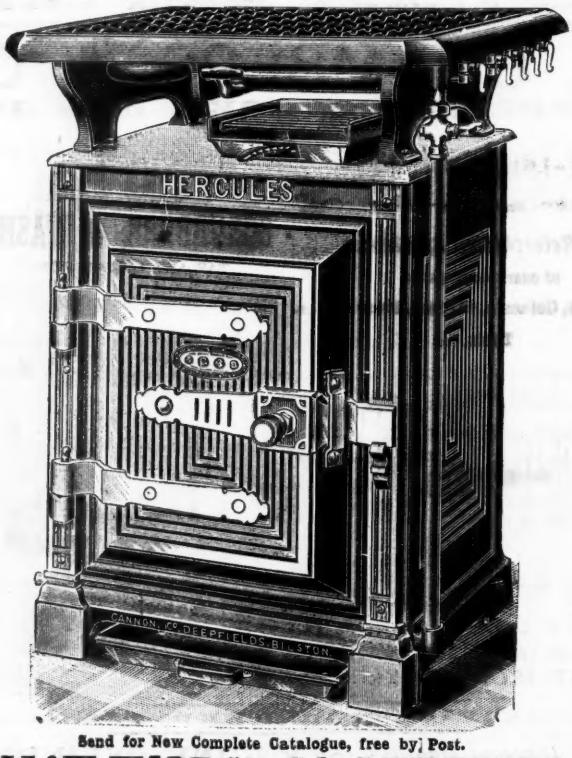
FIRE-CLAY GAS-RETORTS, FIRE-BRICKS, LUMPS, & TILES of Every Description.

GLAZED BRICKS AND PORCELAIN BATHS.

THE "HERCULES"

GOLD MEDAL GAS COOKER.

HIRED OUT BY THE PRINCIPAL GAS COMPANIES IN THE UNITED KINGDOM.



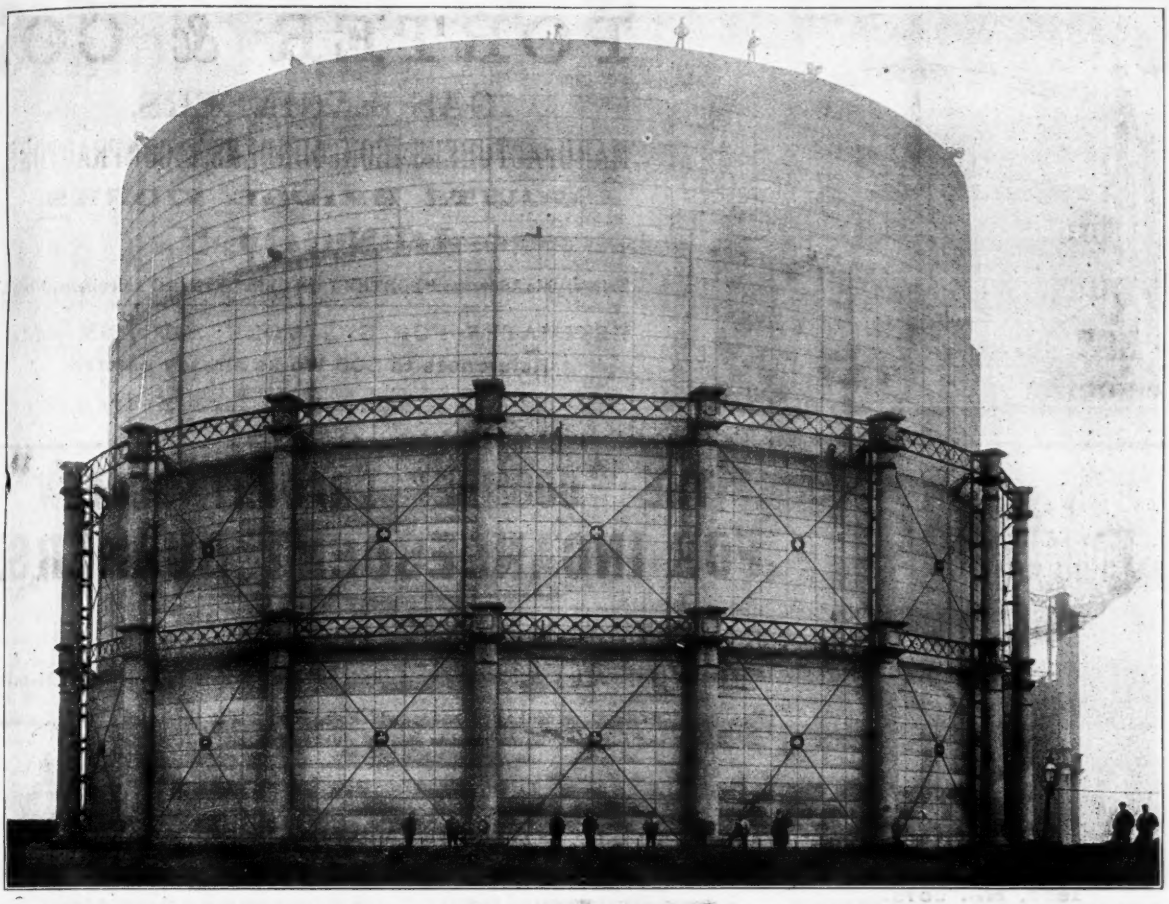
For Excellence of Finish and Durability cannot be equalled.

The Best Cooker for Hiring-out Purposes.

Send for New Complete Catalogue, free by Post.

THE "CANNON" HOLLOW-WARE CO., Ld., DEEPFIELDS, Nr. Bilston, STAFFS.

London Show-Rooms: 58 HOLBORN VIADUCT, E.C.



BIRKENHEAD GASHOLDER, FOUR LIFTS

(160 FEET DIAMETER, EACH 80 FEET DEEP).

The **TWO INNER LIFTS** were added on the **ROPE SYSTEM.**
The **THIRD LIFT** is controlled by **ROPES**, as well as by Columns.

EXTRACT FROM THE ENGINEER'S REPORT, FEBRUARY 11, 1896.

"During a great gale on October 2nd, the holder was at its greatest height (120 feet); and I can safely say it was the steadiest holder on the works. In fact, throughout the whole of October, we experienced exceptionally heavy w ather; and, of course, the holder during that time was tested in all positions, but with the same unvarying steadiness.
(Signed) T. O. PATERSON, Engineer."

THE HOLDERS in which the ROPE SYSTEM has been adopted have a capacity of 15,200,000 cubic feet.

ASHMORE, BENSON, PEASE, & CO., LTD., Stockton-on-Tees.

LATEST

Improvements in Sulphate of Ammonia Apparatus

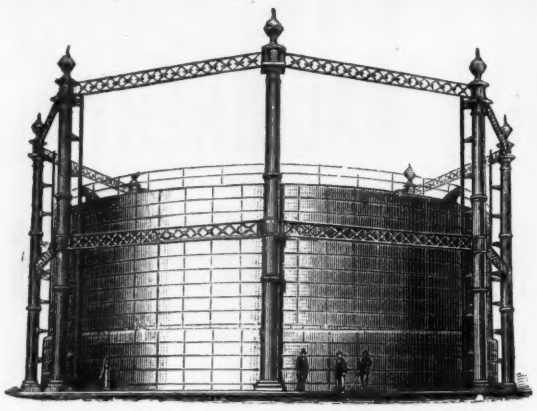
(COLSON'S PATENT)

EXTRACT FROM ENGINEER'S REPORT—

"I can now obtain **60** Tons of Sulphate of Ammonia per week with 'Colson's' Still, using ONE Boiler, whereas, with my former continuous plant, TWO Boilers were required to produce **40** Tons per week."

For Prices and Particulars, apply to the Sole Makers—

ASHMORE, BENSON, PEASE, & CO., LIMITED,
Gas-Works Contractors, STOCKTON-ON-TEES.



PORTER & CO.

GAS ENGINEERS,

MANUFACTURERS, IRONFOUNDERS, & CONTRACTORS,

GOWTS BRIDGE WORKS,

LINCOLN.

Telegraphic Address: "PORTER LINCOLN." National Telephone, No. 13.

ESTIMATES FOR GAS-WORKS OF ANY SIZE.

References to 600 Works already erected.

N.B.—All Communications to be addressed to the FIRM ONLY.

THE "COOMBE" DRAUGHT SCREEN.
Protection granted, 1896, No. 2075.

THE "COOMBE" DRAUGHT SCREEN FOR INCANDESCENT BURNERS.

ADVANTAGES.

1.—Prevents draughts of cold air from ascending the Chimney, and thereby lengthens the life of Chimney and Mantle.
2.—Prevents attempts to light spills, &c., in Bars and Restaurants, by which many Mantles are destroyed.
3.—Presents an ornamental appearance, which greatly adds to the beauty of the Burner.
4.—Prevents "Lighting-Back," and keeps out dust and dirt.

SOLD EVERYWHERE.

Wholesale of the Patentees,

ALFRED ARCULUS & CO., GLASS MANUFACTURERS, BIRMINGHAM.

"An Incandescent Burner without a Draught Screen is like a Man without a Collar."

W. J. JENKINS & CO.

GAS ENGINEERS AND IRONFOUNDERS,

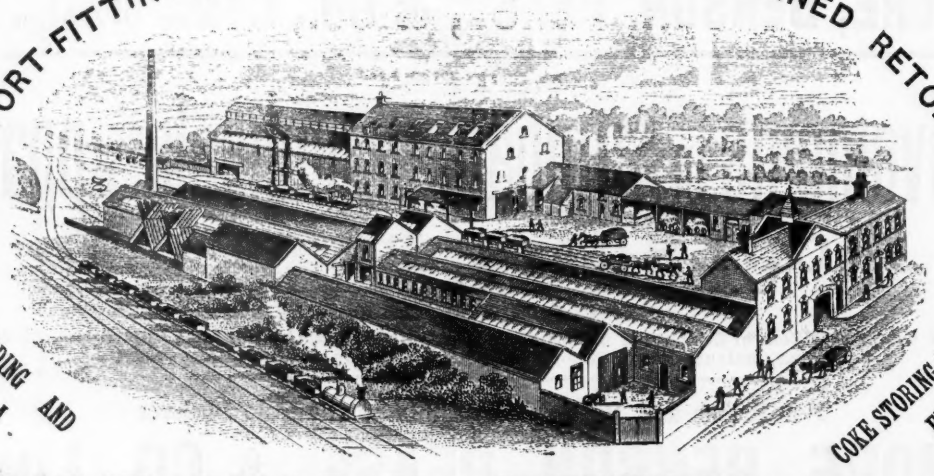
MAKERS OF ALL KINDS OF

PLANT AND MACHINERY FOR GAS-WORKS.

COAL-BREAKERS. COKE-SCREENS.

MOUTHPIECES. LIQUOR-TANKS.

RETORT-FITTINGS, REGENERATOR SETTINGS, INCLINED RETORTS.



COAL UNLOADING AND CONVEYING A SPECIALITY.

COKE STORING PLANT, ENGINES, EXHAUSTERS, VALVES.

BEEHIVE WORKS, RETFORD, NOTTS.

ARROL-FOULIS

PATENT AUTOMATIC MACHINERY

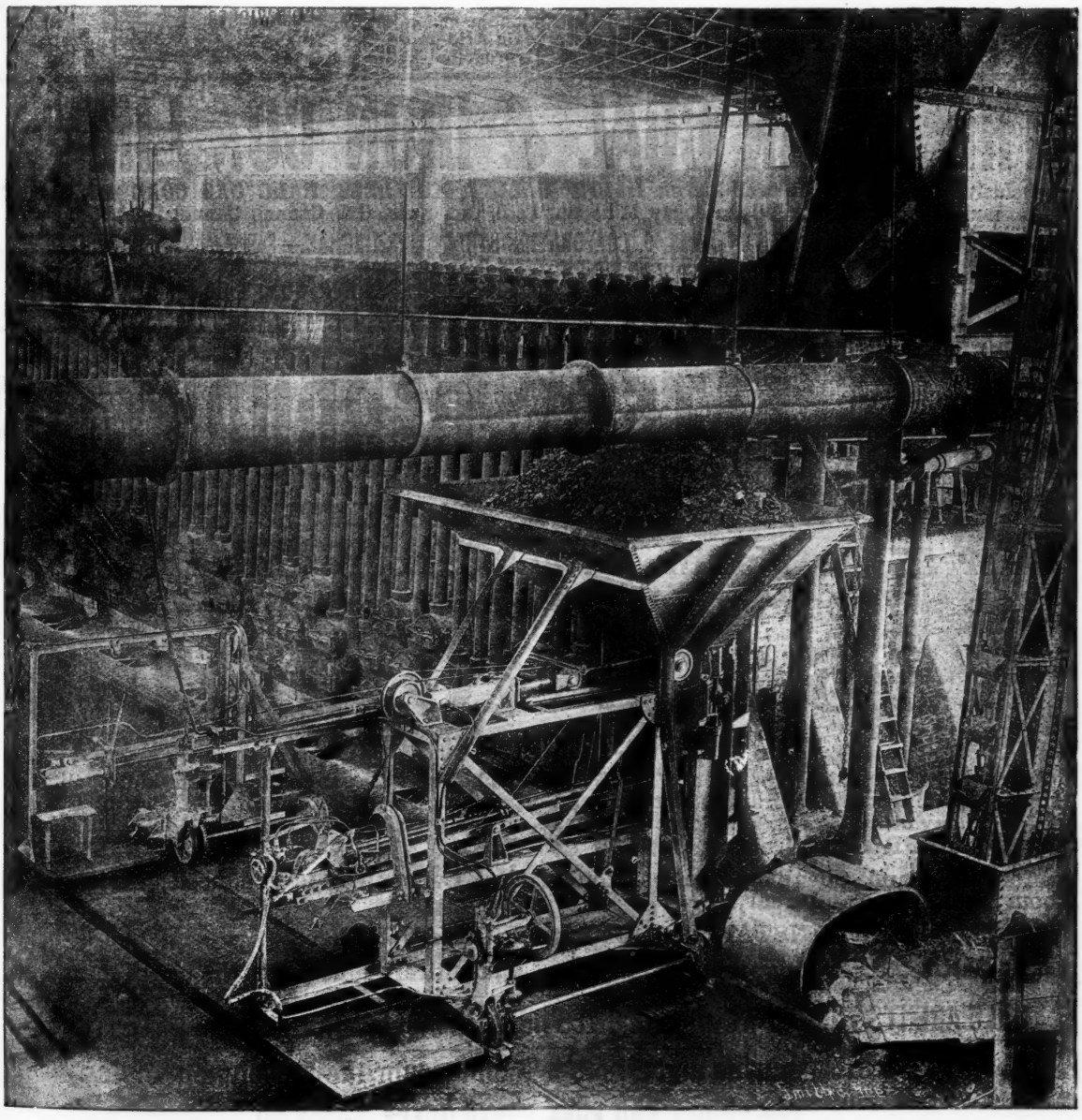
FOR

CHARGING AND DRAWING GAS-RETORTS

SIR WILLIAM ARROL & CO., Ltd., Sole Makers,

GLASGOW.

Plans and Estimates furnished on application.



The above engraving shows the interior of a Retort-House at the Tradeston Gas-Works, Glasgow, where the Machines have been at work since the beginning of 1893, drawing and charging **960 Retorts every 24 hours. 106 Drawing-Machines and 76 Charging-Machines are at work, or in course of construction.**

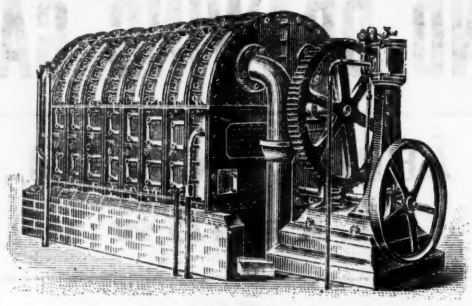
KIRKHAM, HULETT, & CHANDLER, LD.

3 & 4, PALACE CHAMBERS, BRIDGE STREET, WESTMINSTER, S.W.

MARSHALL'S PATENT COMBINED BATTERY CONDENSER AND SCRUBBER.

Extract from letter from Mr. Winstanley, of Coventry: 'The Condensers you erected for us have been in use some time, and are working very satisfactorily.'

PATENT "STANDARD" WASHER-SCRUBBER.

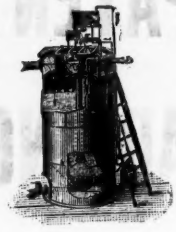


OVER **530** *MACHINES*

In use and in course of Construction.

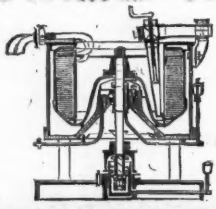
They extract all the Ammonia and a large proportion of Carbonic Acid and Sulphuretted Hydrogen.

BRUUN'S PATENT WATER SOFTENER



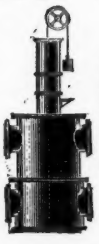
PREVENTS ALL "SCALE" AND SAVES FUEL.

BURMEISTER AND WAIN'S TAR-SEPARATOR.



EXTRACTS OVER 99 PER CENT. OF AMMONIACAL LIQUOR FROM TAR.

MARSHALL'S PATENT TAR EXTRACTOR AND WASHER.



Extract from letter from the Late Mr. Jabez Church: "The Marshall Patent Tar-Extractor has given very satisfactory results."

THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

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TELEGRAPHIC ADDRESS: "WIGAN BIRMINGHAM." TELEPHONE No. 200.

London District Office: 6, STRAND, LONDON—C. PARKER & SON, Sole Agents.

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MAXIM PATENT CARBURETTOR

FOR ENRICHING GAS IN BULK.

Over 50 Maxim Patent Carburettors have now been fixed, capable of enriching

650,000,000

CUBIC FEET OF GAS PER DAY.

Among the Companies supplied are The Gaslight and Coke Company, the South Metropolitan Gas Company, Birmingham Corporation, Manchester Corporation, Rochdale Corporation, Bristol Gas Company, and many other Works, both large and small, where they have been working in some instances for the past **FOUR YEARS.**

More Gas and saleable Coke per ton of Coal Carbonized is produced; saving Capital, Labour, Fuel, Wear and Tear, &c.

The Enrichment is **INSTANTANEOUS** and **PERMANENT.**

The Carburettor is inexpensive, easily fixed, and entirely supersedes the use of Cannel.

SOLE AGENTS FOR REDWOOD & CLOWES' INFLAMMABLE VAPOUR & GAS DETECTORS.

Dealers in Carburine and all other Naphthas for the Enrichment of Gas.

FOR PRICES AND FULL PARTICULARS, APPLY TO

THE GAS LIGHTING IMPROVEMENT COMPANY, LIMITED,

18, DEVONSHIRE STREET, BISHOPSGATE, LONDON, E.C.

W. C. HOLMES & CO.

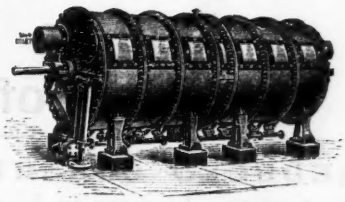
IRONFOUNDERS AND CONTRACTORS,

Makers of
GAS & CHEMICAL
PLANT.

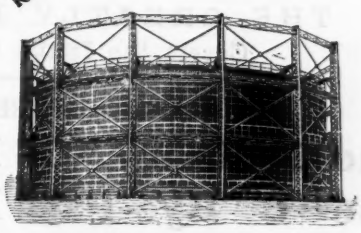
Telegrams:
"HOLMES, HUDDERSFIELD."

Improved
PATENT SCRUBBER-WASHERS,
All sizes,
From 50,000 to 5,000,000 Cubic Feet of Gas per day.
Results unrivalled. Send for Particulars and Prices.

MALLEABLE
and all Kinds of
CASTINGS.



GASHOLDERS of Improved Construction and of all Sizes.
ROOFS, BRIDGES, TANKS, GIRDERS.



Improved
BYE-PASS and
CENTRE-VALVES,
GOVERNORS,
and METERS.

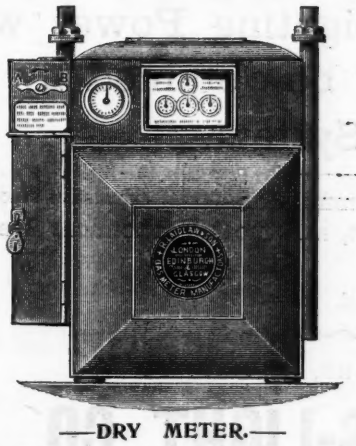
Rotary or Pump
EXHAUSTERS.

80, CANNON STREET, LONDON,
AND
WHITESTONE IRON WORKS, HUDDERSFIELD.

R. LAIDLAW & SON

GAS & WATER ENGINEERS.

MANUFACTURERS OF WET & DRY GAS-METERS,
SIEMENS WATER-METERS,
PREPAYMENT GAS-METERS.



—DRY METER.—

—WET METER.—

EDINBURGH: SIMON SQUARE WORKS. | GLASGOW: ALLIANCE FOUNDRY. | LONDON: 6, LITTLE BUSH LANE.

INCANDESCENT GAS-LIGHT

(WELSBACH PATENTS).

Important Notice.

Large Reduction in Prices From March 2, 1896, Due to Colossal Sales, And Universal Adoption of the System.

THE GREATLY REDUCED CONSUMPTION OF GAS
Covers the Initial Cost of the Burners in less than SIX Months.

The Prices have been REDUCED as follows:—

The Ordinary "C" Burner, price 6/6
The "C" Bye-Pass Burner, „ 7/6

Prices of other Patterns Reduced Proportionately.

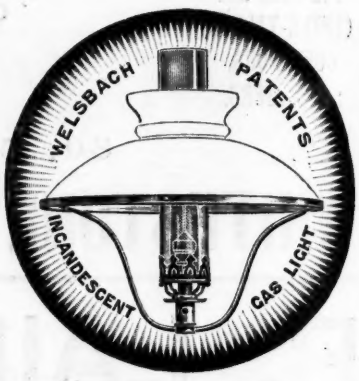
Special attention is called to

The "S" Bye-Pass Burner, price 7/6

which, with a consumption of 2½ cubic feet of gas an hour, gives

A LIGHT OF 25 TO 30 CANDLE POWER.

This pattern is particularly recommended where it is desired to effect a large saving in gas rather than to effect a great increase in the light.



The attention of Gas Managers and Gas Engineers is called to this System of Lighting as one which tends to Popularize the Use of Gas as an Illuminant, owing to the following advantages:—

Economy in Consumption of Gas, combined with High Illuminating Efficiency.
Freedom from Smoke, Dirt, and Flickering.
Greatly Reduced Heat.
The combination of High Lighting Power with DURABILITY can only be obtained by The Welsbach System.

The "Lancet" Special Analytical and Sanitary Commission, in an exhaustive report, pronounces the "Incandescent Gas-Light System" to be the Healthiest, Best, and most Economical System of Gas Lighting.

Suitable for every purpose of Inside and Outside Lighting.

FOR FURTHER PARTICULARS, APPLY TO

THE INCANDESCENT GAS-LIGHT CO., LTD.,

Palmer Street, Westminster, London, S.W.

ARDEN HILL & CO.,

GAS ENGINEERS,

BIRMINGHAM.

No. 1080.

"THE ERA."

(Registered.)

A New Fire, with Circular Front, for this Season.

Has a perfect arrangement to utilize all Products of Combustion.

SPECIALLY MADE FOR HIRING-OUT PURPOSES.

No.	Height. Inches.	Width. Inches.	Width of Fire. Inches.	Price, Best Stove Enamel.
1080	29	20	8½	50s.
1082	30½	22½	10	60s.
1084	31½	25½	13	70s.

NOTE.—Prices include New Duplex Burner, Two Brass Lever Taps, and Fittings all complete, which can be had either right or left hand.

NICKEL PLATED TRIVETS . . . . . 2s. EXTRA.

THE GAS-METER COMPANY, LIMITED

MANUFACTURERS OF

WET AND DRY GAS-METERS, STATION METERS, GOVERNORS, GAS APPARATUS, ETC.

SQUARE STATION METERS WITH PLANED JOINTS.

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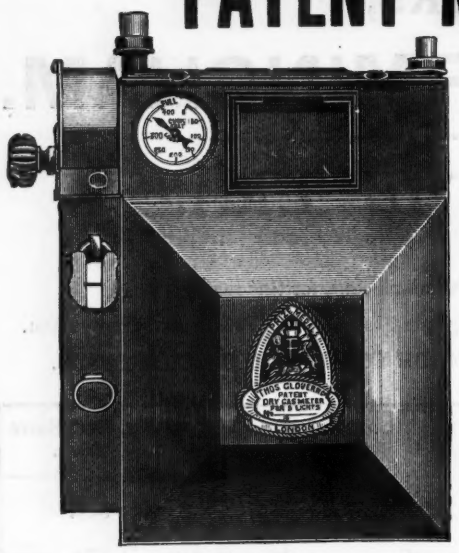

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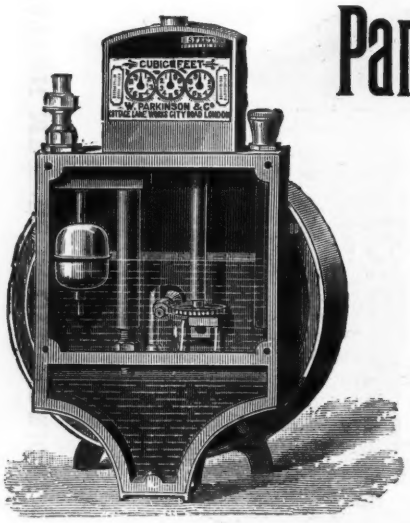

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[See also Advt. p. 884.

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EDITORIAL NOTES.

The Education Question.

AT a time when there is so much outcry about the necessity for more technical education to enable the British workman to keep his standing in face of German and other foreign competition—much more to preserve the pre-eminence which he has hitherto believed to be his birthright—it is grateful to find, in the recently issued report of the Examinations Department of the City and Guilds of London Institute, a certain portion of firm ground upon which one can take a stand, and survey the national position. This ground, it is true, is neither extensive nor elevated. Though the Department has been in operation for a considerable number of years, and has made strong efforts to establish itself as the cynosure of handicraftsmen in all parts of the United Kingdom, it is doubtful how far its pretensions are accepted by those to whom it appeals; and it is equally uncertain how far its own arrangements go in realizing their object. With all its limitations, however, the Institute supplies the only national gauge of proficiency in the technical matters of which it takes cognizance; and its examinations are the only available guide whereby the rising generation of those who are in the stage of apprenticeship to a wide range of trades can arrive at the knowledge of what it behoves them to learn. The report now to hand (which is also noticed in another column) is therefore, so far as it goes, a source of definite information as to the quality of those who are now preparing themselves to carry on the industrial work of the country; and incidentally it also reveals the character of the preliminary preparation received by these aspirants in the various public and other elementary schools. In considering the evidence on these points supplied by the report, it must always be borne in mind that the 30,000 or so of students who last year attended the classes registered by the Institute are only a small—though possibly select—sample of the bulk of cadets of the great industrial army who are actually learning by practical application how to earn their living at some definite trade.

The difficulty of making the work of the Institute in this respect thoroughly comprehensive, is enormous; and it is hard to say what Sir Philip Magnus and his Committee and associates could do to expedite the development of its usefulness. They began by offering to examine candidates; and from this beginning they went on to encourage and assist in imparting sound technical instruction. Now they find that it is their own approved classes and schools that furnish the great bulk of the candidates for examination, which is satisfactory, inasmuch as the number and membership of these classes continue steadily to increase. Learners of trades who do not attend the classes will have nothing to do with the examinations; the unsatisfactory aspect of this state of things being that these unclassed young artizans are the majority. How to turn the minority into the majority? This is the most serious problem to be solved by those who would advance the Institute to the position of the chief national authority on technical teaching. What are the relations of the Institute with the elementary schools from which students of technics must come? There appears to be a want of connection here which ought to be made good.

A significant passage of the present report refers to the discovery by several Examiners of serious defects in the preparatory education of candidates. This is not the only reflection that has been made of late upon the quality of the teaching in our costly elementary schools. "Some "surprise is expressed," we learn from the general report, "that the candidates spell so badly, and experience such "difficulty in expressing what they know in words. It is "probable that many of the candidates, on leaving the "elementary schools, fail to take advantage of evening "continuation classes, and find, later on, when they "commence their technical studies, that they have "forgotten the greater part of what they had learnt at "school before they were twelve years old. . . . "More specific complaints of the Examiners point to a "want of knowledge of drawing and of the habit of "accurate observation on the part of the candidates." This is unhappily not a new complaint. Nor is the

mischief confined to the boys who have only been to public elementary schools. The students who offered themselves as candidates at the preliminary examination in Electric Lighting would in most cases belong to the class of "sons of gentlemen," for whose schooling their parents and guardians probably paid dearly enough. Yet the percentage of failures was very high; and the Examiners complained of the "exceedingly bad "quality of the sketches and diagrams." The public elementary schools, however, must be held responsible for the discouraging fact that more than half the candidates in Typography failed to pass; while the average spelling showed signs of going from bad to worse, and the methods of calculation employed by the candidates were, "as a "rule, bad." Is it not time that a conference of educational authorities was held to overhaul those systems of teaching which cost so much and effect so little?

There is not much to say that is novel concerning the examinations in Gas Manufacture. Wherever gas is made, there must be some young men in and about the works who are, or ought to be, desirous of obtaining a thorough training in, and a good stock of information respecting the conduct of the industry. Many of these learners suffer from a degree of isolation which is unavoidable, and arises from the nature of the business of gas supply; and in a great number of cases it is practically impossible for them to avail themselves of the classes for technical instruction organized by the Institute. It should be consoling to such secluded students to learn from the report of the Examiner in Gas Manufacture, Mr. A. Colson, that evidence of all-round training in connection with the subject is rare. It is precisely this kind of training that attention to, and familiarity with, the routine operations of the smallest gas-works will provide, wherever the undertaking may be situated; but it cannot be obtained wholly from classes and the reading of text-books. Artificial "cramming" of the subject is likely to fail in face of Mr. Colson's simple yet penetrating questions; and there is in class-teaching always some risk of encouraging this abuse. Mr. Colson, however, has not been troubled half so much by "cram" as have the two Examiners in Electric Lighting—Professor S. P. Thompson and Mr. J. Swinburne—whose indignation at the inferior quality of the candidates' work, already mentioned, explodes in trenchant condemnation both of the students and their teachers.

It would appear from a general survey of the contents of the report, including the "extracts" given from some of the individual Examiners' reports, that a more complete correspondence is desirable between the Institute and the elementary schools on the one hand, and employers and practical skilled workmen on the other. While some of the Examiners do not complain of the character and amount of the response to the efforts of the Institute, very many of them are almost in despair on this account. There is a lack of the right kind of candidates, and a similar want of the proper kind of teaching in a great many of the subjects. It is the inferiority of the general education of those candidates who, from their chosen calling, might have been expected to bear a test of this kind, that strikes the reader of these reports as perhaps their worst feature. It is not greatly to be wondered at that the Institute can only get 351 candidates to take up the subject of Brickwork and Masonry. But what can one think when a question set in Telegraphy and Telephony as a test of general education, was "answered incorrectly "in almost every case"? In several other instances, also, there was a painful lack of anything like a common-sense appreciation of the actualities of things. Some of the young would-be electricians displayed a weakness for working out, to any number of decimals, quantities which started from two or three significant figures; and the answers to a question in another paper "as to how "much a certain quantity of paper would produce of a "given size of volume varied from a single hundred "to eight millions"! All this is very sad. We mention these matters here, somewhat at length, for the sake of the warning they convey to the young men who from time to time find themselves candidates for the official appointments in gas-works that are advertised in the "JOURNAL." There are hundreds of young gas engineers at the present moment looking out for openings for professional advancement; and though the pressure of competition for every desirable appointment in the gas industry is as great as it is in any other employment, it is by no means easy to select quite suitable men for a particular post. Apart altogether from cardinal questions of character, age, and health, it is unhappily true that the great majority of candidates for any appointment worth having are not so efficient as they might be. For the good of all who are not past profiting by the lesson, we earnestly recommend aspirants for other rewards than the prizes and certificates of the City and Guilds of London Institute, to give close attention to the observations of the Examiners. If these gentlemen—all high authorities in their various departments of industry—had to pass judgment upon candidates for employment instead of for passes, they could not use very different language in explaining the grounds for making their selections. One candidate cannot spell decently; another seems to know a great deal that is not to the point, but lacks all-round training. This man has no sense of the true import of the language he uses; the other cannot see how absurd a result he has obtained by his laborious calculations. Here is a fairly good man; but his writing is that of a small boy, ill-taught at that—and so on. These are shortcomings that, unsuspected by himself unless he discovers them by rigid self-examination, too often ruin the chances of a deserving man.

The Meeting of the Midland Gas Managers' Association.

LAST Thursday's meeting of the members of the Midland Association of Gas Managers was very largely attended; and as there were three papers to be read and discussed, the proceedings did not lack variety of interest. Mr. W. R. Cooper, of Banbury, presided for the last time; and he is succeeded in office by Mr. John Young, of Hanley. Mr. H. P. Maybury, of Great Malvern, introduced to the notice of the Midland gas managers the ingenious mechanical painter made by the Pneumatic Painting-Machine Corporation, Limited, of the working of which he had a favourable experience to relate. Mr. T. E. Pye described the arrangement called "the incandescent fire-mantel," for facilitating the burning of coke in ordinary domestic fire-grates. Mr. Thomas Glover, of West Bromwich, dealt with "The Commercial Testing of Gas Coal." This is a familiar subject with all gas managers, most of whom, however, have their own particular way of doing the work. Mr. R. O. Paterson, who inherits a name ever to be remembered in connection with the analysis of gas coal, criticized Mr. Glover's method with some severity, as will be seen by our report of the discussion. He did not, indeed, leave much credit with the method described in the paper, after he had done with it; nor was Mr. C. E. Jones, of Chesterfield, kinder to the author's plan. It is doubtless of great importance that gas coals should be regularly tested; but it is quite as important that the testing should be done in the best manner that skill can suggest and experience endorse.

Another Coal Trust.

IT is announced that a strong coalowners' combination is about to be formed in the West of Scotland, to embrace six of the largest producers in this district. The capital of the new trust is to be £2,000,000; and though this sum is no trifle even for these days of heroic financing, it comes with much less of a shock than would perhaps have been experienced if bicycle and beef-tea companies had not accustomed the public to the valuation of successful businesses in millions. This one is the third great consolidation of interests in the coal trade that we have had to notice within a comparatively short space of time; and if it answers, it will certainly not be the last. Consolidation of industrial and commercial interests is making headway everywhere just now. It is a feature of the age that must be reckoned with; and we do not know why anybody should complain of it. Last week the statement was made publicly that the newly-formed Cory combination had been instrumental in preventing a contemplated rise of 1s. a ton in the London retail prices of house coal; and if this is the way in which such organizations are to work, the public will not regret the overshadowing of the small dealers by the associated firms. In another column we have offered a few remarks upon the working of industrial monopolies in the United States; but these appear to be something very different from anything in the way of associated trading that could be carried on under the conditions that prevail in this country. British

coalowners can never obtain absolute control of the means of carriage; and if they were to procure the submission of the railways, there is always the open sea to balance matters. There is no reason, in the nature of things, why the process of consolidation should not go on acceptably in the coal trade, until "cut-throat competition" becomes impossible, and everybody in the trade enjoys the practical working of the rule of "live and let live." This is, at any rate, the idea which we have long supported in these columns; and events seem now to be marching towards its realization.

Charges for Working Private Sidings.

THAT somewhat occult body, the Railway and Canal Commission, was materialized last week, in one of the Queen's Bench Courts, for the purpose of giving judgment on a dispute between a Railway Company and a trader as to the Company's charges for services rendered at the trader's private siding. The case will be recorded as *The Manchester, Sheffield, and Lincolnshire Railway Company v. Pidcock*: and from what we can gather about the issue, the judgment should be an important one for railway companies and the owners of private sidings. The question was: What proportion of the "terminal" charge made to traders who do not possess private sidings should be charged to traders possessing such sidings? Directly, of course, the matter rested upon the construction of the particular Railway Company's Private Act confirming their rates and charges. In this case, the Company were authorized to make certain charges for accommodation and services at a terminal station in dealing with merchandise as carriers thereof. A terminal station, however, is defined not to include a junction between the railway and a siding not the property of the Company, or in respect to merchandise passing to or from such siding and any station with which the siding may be connected. It was provided that the Company might charge a reasonable sum by way of addition to the tonnage rate for services rendered to a trader at or in connection with sidings not belonging to them. It was this charge that the Company in the present instance wished to have fixed. The trader demurred to paying anything beyond the tonnage rate, on the ground, mainly, that the Company contracted to convey and deliver, and also that the conveyance did not cease until the goods were at the right place for delivery—which was, of course, in the siding. The Company argued, against this view, that to traders who used the neighbouring goods station a terminal charge was made which was as much for the haulage of the trucks to the siding where they could be unloaded as for anything else; and they contended that the owners of the private siding should pay a proportionate amount for the same service. The Court considered that this claim was sustainable, and fixed the proportionate charge at three-fourths of the sum actually found to be charged as the station terminal. It is observed in the judgment that while the trader's interpretation of what is meant by "conveyance" might hold good in common law, this service has been split up by various Railway Acts into distinct elements. In construing these Acts together, it appears that the rate for conveyance by goods train might be held to include such shunting into a private siding or other services as are usually performed by the engine of the goods train. The Railway Company, however, are not compellable to go upon a private siding at all; so that it is doubtful whether they could charge anything under statute for doing so. If the siding is long, and the Company have to do any special hauling upon it to convey trucks to the far end, they are to be permitted to charge a proportionate amount for the service, as if the siding were a terminal. The Court considered that in this particular instance the charge should be an agreed one between the parties, having regard to the concurrent use of the siding by the Company for their own purposes. The case shows that, when traders propose to make a private siding, they should beforehand come to an intelligible agreement with the railway company concerned as to how it is to be used.

The Vienna Municipality and the Imperial Continental Gas Association.—Last Tuesday, the Vienna Municipality decided, by 94 votes to 33, not to renew the concession with the Imperial Continental Gas Association, but to erect gas-works of their own. The contract will therefore expire in 1899.

WATER AND SANITARY AFFAIRS.

WITHIN the last few days, a "scare" has been created over certain reports issued by the London County Council relative to the Metropolitan Water Supply. These reports were referred to by us as far back as July 7; and we have been somewhat surprised at the extraordinary excitement which has just arisen concerning them so long after date. Some good may accrue from this, if attention is only properly called to Mr. Dibdin's proposal for improving the quality of the water by means of Clark's softening process. In our former notice of the reports, we made mention of this proposal, and quoted Mr. Dibdin's statement that it seemed as if Clark's process would not only soften the present supply, but would so improve the water in respect to its chemical quality and number of bacteria as to render it comparable with a supply from Welsh sources. By actual experiment, performed on the filtered water supplied by the New River Company, Mr. Dibdin has found that lime could be so applied as to reduce the dissolved organic impurity 25 per cent.; while 64 per cent. of the total hardness was removed, and also 87 per cent. of the bacteria which remained after the usual filtration. At the same time, "the whole of the matters "in suspension" were disposed of—a point of more than ordinary importance, now that the people of London have been given to understand that they are swallowing the equivalent of between 67 and 1145 tons of "wet mud" in their annual water supply. This is simply a mode of expression, in which, in the first place, a minute fraction of dry material per gallon is multiplied into 365 times the 131,600,000 gallons of water supplied by five of the London Companies in a day. It is a big calculation, in which a quantity almost infinitesimal is made to appear as something substantial. In the next place, we must suppose the chemically dry material to be mixed with nine times its weight of water, in order to get the aforesaid "wet mud." The dry stuff weighs from seven tons to a little more than a hundred tons in the year's supply.

Per gallon, it is something like what Charles Dickens would have called "an unstateable fraction." But to get rid of it would cost about £35,000 per annum for lime, in addition to which Mr. Binnie reckons the working expenses at £60,000 per annum, while he estimates that the necessary plant would cost £800,000. Even this would be considerably cheaper than going to Wales for water. Concerning the bacteria in the supply, which would be brought below Dr. Koch's standard of 100 per cubic centimetre by the lime process, there are some astounding figures in Dr. Klein's report. But the entire investigation into this part of the subject is conducted in such a manner that the results must be looked upon rather as scientifically curious than as practically useful. We incline to the opinion that Dr. Klein's enumeration of the microbes was enhanced by a defective state of the filter-beds, due to the action of frost; and he appears to suspect something of the kind himself. We may also observe that there are great fluctuations in the figures—ranging from 16 microbes per cubic centimetre up to the fabulous number of 51,000. That Dr. Klein found this enormous number, we do not doubt; but we are not compelled to believe that anybody drank them. Though, on the other hand, it appears that an extraordinary number of microbes are swallowed in ordinary diet, and inhaled from a dusty atmosphere. So far as Mr. Dibdin's researches are concerned, the Council have ordered them to be continued for six months, at a cost of £10 per week. We rather think Mr. Dibdin has told his story; the moral being that whatever is considered defective in the present supply can be remedied at a moderate cost. Sir John Lubbock and others look upon the additional outlay for analyses as a waste of money. We certainly cannot see that it will carry the question any further than the point it has already reached.

Two annual reports from the Local Government Board in one year amount to an official phenomenon. The report for 1894-5 was with us in February last. We then complained that things were late, as not until that date did we obtain the benefit of General Scott's report for 1894. We are now more happily situated, for instead of waiting for the Board's report until February next, we get it at the close of October, including General Scott's report for 1895. As usual, Dr. Frankland's report in the present volume is

a repetition of that which he presented to the Registrar-General some months ago. But there is no harm in that, as the other report came early. General Scott remarks that, under the constant system, the demand for water in the Metropolis increases enormously during frosts, owing to the fact that many householders commonly keep their taps open with a view to counteract their tendency to freeze. The constant supply system is described as breaking down under the stress of severe frost and the consequent fracture of pipes. It is also spoken of as failing "under the conditions of lavish use, misuse, "and waste of water during periods of prolonged drought." So we are told: "In cases where house cisterns do not "exist, acute inconvenience and the collapse of modern "sanitary appliances are then rife." General Scott goes on to observe that "the weak point" in the constant system as at present worked is the "surrender of all control of the "supply at times of drought, heat, or frost." Unfortunately, when the Companies attempt any such control, even in the mildest possible form, they are virulently attacked for their pains. The report states that inter-connection of the mains of the several Companies has been effected to some extent, "but not so fully as is desirable." Mr. Allen Stoneham, the Government Auditor, reports that during the past year considerable sums were expended in consequence of the severe frost, in replacing burst pipes and lowering others. He concurred in the proposals to spread this extraordinary outlay chargeable to revenue over accounts beyond the half year in which the work was actually carried out.

The Earl of Onslow spoke at considerable length at a large public meeting held at Bow last Wednesday. His Lordship stated the case of the East London Company very fairly, and called upon the voters "to sweep away Mr. Stuart, "Mr. Sidney Buxton, and the remainder who had prevented "them from having a sufficiency of water." He was in favour of purchase, but on honest and honourable terms. A resolution was passed, calling on the Government to constitute an authority for the water supply, representing the interests of the consumers, with powers of control and purchase. The "Daily Chronicle" is dissatisfied with "Lord Onslow's water meeting at the East-end," but, in recognition of the Earl's influence, considers that "whether 'water purchase shall now succeed or fail rests mainly in "his hands." A "conference" on the water question, convened by the Hackney Vestry, was held on Friday evening, at which a Committee of portentous magnitude was appointed, to consider what should be done to get the water supply of London placed "in the hands of a popu-"larly-elected body." It appears doubtful whether all who are appointed on the Committee will serve.

The Matlock Bath Gas-Works Arbitration.—Sir W. Coddington has accepted the position of Arbitrator to settle the price to be paid by the Matlock Bath District Council for the works of the Gas Company. The Council, it will be remembered, offered £13,000; but this was refused.

Another Acetylene Explosion.—In "Le Matin" of the 29th ult., there was a paragraph recording another explosion of acetylene, which took place at about half-past ten on the previous Tuesday morning. A gentleman named Gervais had fitted up, for the lighting of his house, a cylinder of acetylene gas, which exploded, and seriously mutilated a tinman and his labourer who were at work on the premises.

The Spontaneous Combustion of Charcoal.—Attention is called by "Nature" to the results of an inquiry into the alleged liability of wood charcoal to spontaneous combustion, by Mr. W. D. A. Bost, as recorded in a volume published by Mr. A. Gardner. The fact seems to be that though freshly-made charcoal—that is, charcoal which has not absorbed its moisture—and oxygen is liable to so-called spontaneous combustion, it is never liable to re-ignite after having been exposed to the air for a few days. In any case, it seems that if after a short time no fire shows itself, the charcoal may be regarded as safe.

Incandescent Gas Lighting for St. Paul's Cathedral.—The Dean and Chapter of St. Paul's are again trying an experiment in the lighting of this vast edifice. The present system—the standards in the nave and the jets at the top of the quarter-arches of the dome—is totally inadequate; and, moreover, the jets of gas are not only destroying the stonework, but very seriously injuring the splendid mosaics which surround the dome. It is proposed to use incandescent gas-burners; and the authorities are having large globes with five burners in each suspended from the top of the columns of the quarter-arches, with the view of spreading a more beautiful and effective light around.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 868.)

THERE was not much improvement to be discerned last week in the general condition of affairs on the Stock Exchange. At the opening, things were fairly steady; the settlement was thought to be going well; and all the money wanted was readily obtainable. But two disturbing elements soon made their appearance. The loud crowing of the Bryanites alarmed those who had been feeling cock-sure of M'Kinley; and there was some timid selling. We have all along believed that the good sense of the country will renounce Bryan and all his works; but the election is not a certainty—all over but the shouting. Then the Kaffir market was in a most uneasy state; and there was weakness in the Foreign. On the other hand, Home Rails were brighter; and, at the close, the worst of the depression seemed to be past. The Money Market is firm; and rates are steadily kept up. Business in the Gas Market was quiet in every issue, except Imperial Continental. The debate in the Vienna Town Council was closed by carrying the resolution not to renew the contract with the Company, and to erect new works and lay new mains. This is as bad at it can be at present; but we have yet to see what will come of it. Fortunately, there is plenty of time for common sense to prevail. The general tone of the Gas Market, influenced perhaps by this incident, was rather dull; and movements in quotations are nearly all in the downward direction. Little business was marked in Gaslight "A;" and prices languished for want of support, while the price nominally fell a couple of points. A few of the secured issues were just rescued from inactivity; prices being middling generally, while the "K" 6 per cent. receded a point. South Metropolitan was affected like the rest, and had a slight fall; but the debenture stock gained a point. Commercials were about on an equilibrium, and gave no sign. Business in the Suburban and Provincial division was of the quietest; and they presented no feature beyond a little drop in British. In the Continental group, the weakness of Imperial is shown by the contrast between 234—the opening price—and 211, which was marked on Saturday. Union and European fell away in sympathy, though, of course, they are not touched by anything that goes on in Vienna. The one advance in quotation is presented by Buenos Ayres. Water was weak, and many quotations gave way further; but at the Mart a good buyer gave a record price for a New River Adventurer's share. Bating Directors' fees and value of reversions, the purchaser gets a present return of 2 3-16 per cent. for his money.

The daily operations were: Gas business on Monday was mainly in Imperial Continental, which was steady. European fell ½. In Water, East London fell 3; Kent, 5; and West Middlesex, 2. Tuesday was very quiet; and Union fell 3. In Water, East London regained a point; but Southwark "D" and both Lambeths lost 2. Wednesday was weak, and Gaslight "A" receded 2; ditto "K," 1; and Imperial, 5. In Water, Lambeth fully-paid regained 2. Business was quiet on Thursday; but further weakness was developed. Imperial receded 2½; and British, ½. But Buenos Ayres rose ½. East London Water regained 2. On Friday, there was a good deal doing in Imperial—the weakness steadily increasing, and the quotation dropping 3 more. In Water, Chelsea and Grand Junction lost 2 each. The onslaught on Imperial proceeded on Saturday; and it dropped 4½ more. Union also fell 2; but South Metropolitan debenture was 1 higher.

ELECTRIC LIGHTING MEMORANDA.

The Advance of Fire Insurance Premiums on Electric Lighting Stations—A Plea for Mercy—The Case for the Fire Offices.

RECENT action on the part of the Associated Fire Insurance Companies in raising the rate for electric lighting stations to 10s. 6d. per cent. has naturally stung the electric lighting interest generally, both municipal and private, into threatening all sorts of reprisals. Such action constitutes a particularly bitter satire on the claim for superior safety advanced on behalf of the electric light; so that it is no wonder that electricity supply companies and corporation committees are raising a loud hubbub about it. Besides the slur thus cast upon electricity, there is the painful fact that a half-guinea fire insurance rate mounts up to something very considerable where the property is valuable, and the electric lighting business is not able to bear such an addition to the cost of working. The electrical journals, as in duty bound, have valiantly come to the support of the afflicted central stations; and one of them set about collecting opinions as to the prospects of the formation of a mutual fire insurance fund for the industry, which was suggested as a measure of protection. The result was interesting in a way, but fatal to the idea in question. Every business man knows something about mutual fire insurance by owners of one kind of risk; and by this time even electricians have learnt that electric lighting must be carried on under the same conditions that govern other businesses. Accordingly, the

mutual insurance scheme fell very flat. One gentleman who gave his opinion on the proposal curtly dismissed it as ridiculous; and another more gently observed that no successful insurance company would think of accepting one class of risk. The plan has been tried, of course, like most of the brilliant notions of contemporary innovators. Not so many years ago, the dry goods warehousemen of Wood Street revolted against the tyranny of the Fire Offices, and undertook to insure themselves by the mutual principle. Then came in Wood Street one of the greatest fires in the recent history of the City of London; and the grand mutual insurance association "went up" in the flames.

Like the dry goods men, the electric lighting people will have to submit to the terms of the tariff offices. They can go outside, of course, if they think the security good enough. But municipalities must be protected; and no municipal officer is likely to risk the ratepayers' property and his own position on the hazard of a small economy in fire insurance rates. Those who are compelled to pay comparatively high rates of insurance usually do grumble; but in their hearts they know very well that if the Fire Offices dared take every class of risk at the eighteenpenny domestic rate, they would be only too glad to do so. It has been pleaded that the Fire Offices ought to discriminate between different electricity supply stations. One of our electrical contemporaries advances this plea in a moderately-worded and very plausible article, which lays stress upon the circumstance that some central supply stations are of much later date than others, and that in the best establishments of the kind a great deal of experience has been utilized to reduce the risk of fire. Moreover, it is plaintively argued that the Fire Offices really ought to realize how much they are indebted to electrical enterprise for the reduction of house-fire claims by banishing "gas, paraffin lamps, and candles from a large percentage of houses insured." It is thought to be most unkind—we had almost written unladylike—for the Fire Offices to be so hard upon an enterprise, the continued progress of which they have so much reason to encourage.

All this is very pretty and insinuating, no doubt. But fire insurance is a business which, of all others, is governed more by facts and statistics than by considerations of sympathy with struggling enterprise. Another electrical contemporary has reproduced the views on the same subject of a "prominent fire officer," and these are as sternly uncompromising as Fate. He first dismisses as impracticable the notion that fire risks of any class can be dealt with individually, with discrimination of their merits. Fire insurance must be conducted by a system of classification, which is based upon long experience. The rates are kept under constant surveillance; and when a particular class of risk is found to be a losing one over a period of (say) ten years, it is decided to be underrated, and the requisite correction is made. This has been the record of electric light station risks. At first, the offices were without experience of the new department; and it appears that in some instances underwriters were disposed to believe the protestations of electricians that nothing could be safer than their operations. But they know better now. During the last ten years, the offices have been caught by fire losses of electric lighting stations amounting to upwards of £65,000; and this means a large deficit on the premium account at the old rates. Hence a revision of the rate was imperative. It does not follow, however, that, as a contemporary has remarked, there is no encouragement to the building of electricity supply stations in the best manner to avoid fires, because the Fire Offices will not take this consideration into account. Nobody, whether insured or not, wants his premises burnt down and his business interrupted—perhaps ruined—in consequence. Every fire at an electricity supply station tends to discredit the whole enterprise; for the unreasoning public are apt to think that if the electricians cannot keep their commodity in proper order at home, it will be likely to make itself even more objectionable abroad. It certainly will not do the electric lighting industry any good to quarrel with the Fire Offices. Our electrical contemporary's innocent prattle about the extent to which fire underwriters ought to feel grateful to electricians for reducing general fire risks is slightly "queered" by the fact that only last Thursday night the switch-board at the Prince of Wales's Theatre, in London, burst into flames, and the house was plunged in darkness in the middle of the second act of the play. No great harm was done—the fire being quickly got under by the theatre staff; but the gravity of the occurrence will not escape the Fire Offices.

A TALE OF THE STANDARD OIL COMPANY AND OTHERS.

In the curiously-named book by Mr. H. E. Lloyd,* the world is told a strange story of some of the financial and industrial developments for which the United States have become notorious. From time to time it has been necessary for us, in the course of our criticism of the carburetted water gas, the electric tramway, and other mushroom growths of modern American enterprise at home and abroad, to draw attention to the fact that the development of these departments of manufacturing and financial activity has been forced in a manner to which a parallel would be sought in vain elsewhere. It is not that the particular examples we have named are not good things in their way; but what strikes a foreign observer as so remarkable in their history is that they have been subjected to a process of artificial incubation for some reason which lies outside their own technical record. We know now pretty well what to think of carburetted water gas for English use; and the British gas industry is indebted to American experience for putting this alternative to coal carbonization at the disposal of English gas manufacturers in a perfected state of technical development. Even now, however, there is not much to choose between coal and carburetted water gas, under local conditions that are to be found in a good many places on both sides of the Atlantic; and it is not so long ago that, even in the States, carburetted water gas had few friends, and not by any means a brilliant future. The time came when all this was changed, as it were, in a flash. One after another, steady-going old gas companies, making coal gas much as it was and is made all the world over, found the control of their property displaced. New gas companies sprang up in other localities to compete for patronage in an already crowded market; and all these fresh intruders into the American gas industry meant to make carburetted water gas. The new spirit thus imparted to the gas industry of the United States waged relentless war upon the old interests, and gained the supremacy. This victory was not due to the superiority of the new technical methods; because, however good these may be now, they had to be created after the face of the American gas industry was changed. The new men who went into the industry were "smart;" but it was not their smartness that delivered the cities of the States into their hands. There was a power behind them which proved irresistible; and this force was that of the Standard Oil Company—at the present hour one of the unacknowledged Great Powers of the world.

It must frequently have puzzled British observers of these matters to account for the trick of getting into a gigantic "trust" or "combine," which is so marked a characteristic of modern American manufacturing enterprise. How is it, for example, that the Standard Oil Company could manage to obtain control of the gas industry of half the American continent, so as to force upon the community a system of manufacture which at the time very few technicians believed in? More—how is it that at the present day the world's trade in petroleum is the monopoly of the same industrial organization?

It is such questions that Mr. Lloyd sets himself to answer; and we have pleasure in introducing his interesting book to our readers. The spirit of his writing may be gathered from his introductory sentences, which are artfully framed to catch the eye and arrest the attention. "The world, enriched by thousands of generations of toilers and thinkers, has reached a fertility which can give every human being a plenty undreamed of even in the Utopias. But, between this plenty ripening on the boughs of our civilization and the people hungering for it, step the 'cornerers,' the syndicates, trusts, combinations, with the cry of 'over-production'—too much of everything. Holding back the riches of earth, sea, and sky from their fellows who famish and freeze in the dark, they declare to them that there is too much light and warmth and food. . . . The majority have never been able to buy enough of anything; but this minority have too much of everything to sell." Mr. Lloyd paints with a full brush, of course; just as Peter Pindar before him "went for" the object of his satires with a heavy hand, and for the same reason. His exuberance of epithet and turgidity of style are rather difficult to get on with; but he is effective in his way, and has much to tell that is worth knowing.

What is a monopoly, and are there any such things in the trade and commerce of the United States? Lawyers answer in the negative, because there is no power in the national legal system to prevent anybody from buying or selling anything. People who recognize facts as distinct from legal fictions declare that there are in the United States monopolies controlling the production and distribution of "an incredible number of necessaries and luxuries of life, from meat to tombstones." It is alleged that in "gas," among other things, there are "hundreds of millions" of dollars. "Quite beyond ordinary comprehension is the magnitude of the syndicates, if there is more than one, which are going from city to city, consolidating all the gas-works, electric lighting companies, street railways in each into single properties, and consolidating these into vast estates for central corporations of capitalists." Laws against these combinations have been passed by Congress and by many of the States. There have been prosecutions under them by the State and Federal Governments. "The laws and the lawsuits have alike been futile." The evil lies deeper than any public sentiment or public intelligence yet existent, and is stronger than any public power yet "at call."

Mr. Lloyd lays it down that "what we call monopoly is business at the end of its journey." He appears to mean that this is what business comes to when business men never "retire," according to the old custom. The suggestion confirms the prevalent suspicion that those who are in the way of making money in America like to keep on at it, with occasioned interludes of London and Paris, until they drop in their tracks with the last-won dollars in their clutches. The great American public do not quite know what to make of the outlook; and so

* "Wealth against Commonwealth." By Henry Demarest Lloyd. New York: Harper Brothers; 1896.

Mr. Lloyd obligingly comes to their assistance. As it would be superfluous to give too many examples of a movement in commerce the existence of which is universally recognized, Mr. Lloyd confines his powers of full enlightenment to the greatest of all—the Oil Trust, which is described, to whet the reader's curiosity, as "the best illustration of a movement which is in itself but an illustration of the spirit of the age."

It is immediately made to appear that Mr. Lloyd does not mean to write in a strain of laudation of the Standard Oil or any similar Company, for he begins his story by reminding his readers that "Rome banished those who had been found to be public enemies, by forbidding every one to give them fire and water. That was done by all to a few. In America it is done by a few to all. A small number of men are obtaining the power to forbid any but themselves to supply the people with fire in nearly every form known to modern life and industry, from matches to locomotives and electricity. They control our hard coal and much of the soft, and stoves, furnaces, and steam and hot-water heaters; the governors (?) on steam boilers and the boilers; gas and gas-fixtures; natural gas and gas-pipes; electric lighting, and all the appurtenances. You cannot free yourself by changing from electricity to gas, or from the gas of the city to the gas of the fields. If you fly from kerosene to candles, you are still under the ban." This might not be a bad thing for the consumers of the articles in question, inasmuch as monopoly need not necessarily imply the enhancement of the cost of the supply. But Mr. Lloyd has no doubts on this score. Take the case of the Match Company, "by whose consent all the fires in the United States and Canada are lighted." There were thirty-one manufacturers of matches who either went into the combination or were bought out. Only thirteen factories were allowed to continue working; and the price of matches was kept at a comfortably high figure, which provided plenty of money for those in the business, and enabled them to keep off competition. Match making is, of course, one of the industries protected by the United States Government, in the interest of the American workman.

The process by which the bituminous coal deposits of America are being appropriated by the men who had already formed the anthracite pool and obtained control of the oil production, is as simple as it is effective. The railroad syndicates buy up all the best bituminons coal lands along their lines, so that eventually nobody else will be able to work them. Individual owners are bound to sell, or be ruined, because the railroad managers have it in their power to "put the screw on" by extending exceptional favours to those mines in which they are interested, and refusing to send trucks to those which are outside the sphere of their own plans. It is the same with iron and timber lands. "A new law of industry is rising into view. Ownership of the highways ends in ownership of everything and everybody that must use the highways." There is no nonsense about the coal-owning railway company. If a mine-owner will sell his property to them at their own figure, well and good. If not, he gets no trucks, if the company can help it; and up go the rates all over the system. This does not hurt the railway company, because what goes out of one pocket returns to the other. But the private coalowner cannot withstand this compulsion long. He could put his coal upon the market at a lower price than the big company charge; because he is not burdened with their watered capital, extravagant salaries, and other expenses. The unfittest, commercially, survives in this struggle; and the consumer pays for all. The working miner, according to Mr. Lloyd, suffers oppression in this Land of Liberty to an extent that recalls the days of serfdom in the Scottish lowlands. Nothing like our Truck Acts protect the poor American miner; and though laws have been passed to keep the railway companies in check in regard to their dealings in coal, these powerful corporations go on their way defiant of both State and Union, there being none to make them afraid. One would think this part of the picture unduly dark. But Mr. Lloyd is able to give chapter and verse from public papers for the worst of his allegations. We shall see later what he has to say concerning the oil traders.

The Proximate Constituents of Coal.—According to Professor Bedson, ordinary coal is practically insoluble in all reagents, but can be converted by treatment with dilute hydrochloric acid and potassium chlorate into soluble products, the composition of many of which has been ascertained. By repeated treatment, no less than 75 per cent. of the coal can be dissolved. Brown coal appears to behave in like manner.

The Boring for Coal at Dover.—Considerable progress has been made with the boring operations for coal at Dover; and the gault and lower greensand have already been passed through. The depth of the first layer of coal is 1113 feet; and, at the present rate, the coal-bearing strata should be reached by June next. On Friday, the 23rd ult., the second shaft, which is about 200 feet to the east of the first one, was started by Mr. F. Brady, the Engineer of the South-Eastern Railway Company. He remarked that it was not a question of whether the coal was to be found in working quantities, as of this they were certain. It was only a question of expense; and against this they had assured themselves by making pits of large diameter, which would enable them to haul about 8 tons of coal at a time.

OBITUARY.

A vacancy has been created on the Directorate of the Windsor Gas Company by the death of Mr. J. Atkins, of Eton, who was for many years connected with various local institutions in the neighbourhood of Windsor.

The obituary columns of "The Times" last week contained announcements of the deaths of Mr. D. A. BLACK, of Messrs. J. Milne and Son, and Mr. J. DRABBLE, who was for about forty years in the service of Messrs. Bryan Donkin and Co.

PERSONAL.

Mr. W. H. ANDREW, the Deputy Town Clerk and Deputy Clerk of the Peace for Cardiff, has been appointed Town Clerk of York, in succession to Mr. G. M'Guire, who has gone to Bradford. Mr. Andrew is only 34 years of age, and is by profession a solicitor.

Mr. A. E. BROOKS has been appointed Manager's Clerk at the Shipley Gas-Works; and he commenced his duties yesterday. The successful candidate has for the last four or five years held a similar position under Mr. J. Eldridge, at Oxford. The post was recently advertised in the "JOURNAL" under No. 2706.

The relinquishment by Mr. JOHN M'LAREN of the management of the Tranent Gas-Works, to take a similar appointment at Duns, afforded his numerous friends an opportunity of testifying in a tangible way their regard and esteem for him. This they did by asking his acceptance of a marble timepiece and a pair of bronze and marble vases, together with a purse of sovereigns. Upon the timepiece was a plate bearing a suitable inscription.

Water-Meters as Waste Preventers.—The effect of meters in checking waste of water is well shown by the experiences of Atlantic City, a seaside resort near Philadelphia. Under the water-rate system, the consumption of water was increasing at an alarming rate—it being trebled in about three years. On introducing meters, however, on to 70 per cent. of the services, this increase was not only checked, but the demand fell from 7,000,000 to 6,300,000 gallons; and there has been no complaint as to scarcity of water.

The Export of Oil from Batoum.—Last year, Russia shipped 292,424,000 gallons of illuminating oil to various countries. The largest consignment in Europe came to England—30,865,000 gallons; Austria-Hungary standing next, with 29,616,000 gallons; France taking 15,896,000 gallons; and Belgium, 10,827,000 gallons. The shipment of nearly 300 million gallons of refined oil from the port of Batoum last year is a fact of much importance, when it is borne in mind that the United States exported only 677 millions, or but little more than twice as much.

Welded Joints.—Some experiments made at the engineering laboratory of the University of Michigan to determine the strength of welded joints are of interest. Of a number of the specimens tested, not one broke in the weld. As, however, some of these were slightly larger at the weld, a new set of specimens was prepared, and a cut taken from each in the lathe to reduce the piece to a uniform diameter throughout its length between the jaws of the testing machine. Common round iron was used. Three bars were taken at random—1¼, 1, and ¾ inch in diameter. From each bar four specimens were prepared—one solid, one lap-welded, one butt-welded, and one split-welded. The results show that only two specimens—both of them lap-welded—broke at or near the weld. The fracture in one case was slightly crystalline, and in the other fibrous. The strength in no case differed much from the strength of the solid parts.

Gas-Aided Fuel Fires.—A few weeks ago, a request was put forward in "Nature" for information respecting the Siemens gas and coke fire; and, in response, Mr. P. W. Clayden sent some very interesting particulars which were referred to in a "Note" in the "JOURNAL" for the 6th ult. Dr. William Pole, F.R.S., the author of "The Life of Sir William Siemens," in a letter given in a recent number of our contemporary, says it is worthy of remark that the chief feature in Sir William's invention—namely, the general idea of using gas to aid the ordinary fire, instead of applying it merely to heat inert material—is capable of much simpler, cheaper, and more extensive application than it has yet met with. Gas-aided fires have already been introduced; their only difference from the ordinary household fire consisting in the introduction of a few common gas-jets among the fuel, which may be either coal or coke, or preferably a combination of the two. Dr. Pole says the same idea may be applied in other ways. He has lately seen, in an artist's studio, a "gas torch," which was attached to a flexible tube, and thrust between the bars when wanted. He alludes also to Professor Ramsay's ingenious contrivance with the same object, mentioned in his lecture at the congress of the British Institute of Public Health in Glasgow (see *ante*, p. 180). In any case, the easy command which the gas gives over the general management of the fire is a great domestic convenience. Its only drawback is a temptation to indulge in a somewhat lavish consumption of gas.

NOTES.

Alleged Successful Use of the Divining-Rod.

Mr. C. Leeson Prince, of the Observatory, Crowborough Hill, Sussex, writes to "Notes and Queries" to confess his conversion to belief in the power of the divining-rod as an agency for the detection of subterranean waters. He gives his reasons in narrative form. Some eight or nine years ago, it appears, a stranger called upon him respecting a contemplated local improvement, and, incidentally claiming to be able to use the divining-rod for this purpose, he indicated by this means a spot in Mr. Prince's garden where water would be found. Mr. Prince thought no more about the matter; but three years since he sold the same property to a lady who wished for an increased water supply. He informed her of the statement of the diviner, to which she paid no heed, and had a well sunk unsuccessfully in a different part of the estate. Another diviner was then sent for, who declared there was water to be found on a spot within a yard of where the first man had indicated it. Water was actually found here at a depth of rather less than 20 feet. "When the lady saw the twig point downwards in the man's hand, she expressed a wish to try if it would act in the same way in her hand, which, of course, it did not. He then told her that if he put his hand upon hers it would, which it accordingly did." Mr. Prince says he reports this case from personal information of the facts; and he adds that only a few weeks since he heard of another successful case, in an adjoining parish, precisely similar to the above in every particular.

Lightning-Rods and Gas-Pipes.

In an article on lightning-rods, the "Builder" observes that most people are contented with a surprisingly small amount of knowledge of this subject. Since Franklin proved that a lightning-flash and a spark from an electrical machine merely differ in magnitude, and hence that pointed iron rods might be used to protect buildings, popular knowledge of the matter has made very little progress. Up to 1881, there was no code of rules published in this country for the erection of lightning-conductors, and since this time the attacks of Professor Oliver Lodge on the report of the Lighting-Rod Conference, and the defence of the report by Mr. W. H. Preece, have left a good deal of scepticism extant as to the efficiency of conductors. It must be admitted that, while the loss of life and property due to lightning is considerable, and can be greatly reduced by the fixing of proper conductors, no rigid rule is known whereby absolute protection from lightning can be attained. Professor Lodge has advised the use of iron for conductors, in preference to copper, because it has a higher fusing-point and greater specific heat, and is therefore capable of getting rid of a larger amount of the energy of a lightning discharge. It is recommended that where a long piece of water or gas piping comes near a lightning-conductor, there should be a capacious metallic connection between them. In practice, it follows from Professor Lodge's experiments that an ordinary galvanized iron wire rope is as efficient as a copper conductor, and that such a rope $\frac{7}{12}$ inch in diameter is amply sufficient. The question of whether or not to connect all masses of metal, such as lead roofs, pipes, hot water systems, &c., to the lightning-conductor of a building, is one that requires careful consideration. Having gas and water pipes all over a house is supposed to increase its liability to be struck by lightning, while connecting everything of the kind to the lightning rod or rods, without reference to their own connection with "good earth," is a dangerous thing to do. A number of practical rules for fixing lightning-rods is given in the "Builder" for the 24th ult. According to these, gas-pipes and electric lighting wires should be kept away from lightning-conductors; while if a water-pipe goes near them, it should be connected metallically. This is obviously because in the case of the former the meter constitutes an interruption in the way of the earth connection which does not exist in the water-piping. Hence it might be worth while, in particular instances, to make a metallic bye-pass to the meter, in order to effect the conveyance of a chance lightning discharge to earth through the service and the main.

The Equivalent Value of Gas and Electricity.

In the course of his opening remarks when presiding at the last meeting of the German Association of Gas and Water Engineers, Herr W. von Oechelhaeuser, the General Manager of the German Continental Gas Company, laid before the members some figures showing the equivalent value of gas and electricity. They showed that, with incandescent gas lighting, at ordinary pressure, the cubic metre (35·3 cubic feet) gives the light of 560 Hefner-Alteneck units, or about 460 English candles; while with incandescent electric lighting, using so-called 16-candle lamps, 2 kilowatts are required to produce this quantity of light. Consequently, the figures would stand thus: 1 c.m. = 2 kilowatts. With incandescent gas lighting at a pressure of 1 m., the above-named quantity of gas will furnish the light of 1000 Hefner units, or about 820 candles; while with the electric arc system 1 kilowatt is required. For motive power, to produce one effective horse power in small motors requires an expenditure of about 800 litres (28·25 cubic feet) of gas; in large motors, about 600 litres (21 cubic feet). A cubic metre of gas, therefore, would produce 1·25 to 1·66 horse-power-hours; whereas 1 kilowatt of electricity would be equal to from 1·08 to 1·22 horse-power-hours. Roughly, then, the figures stand thus: 1 c.m. = 1 kilowatt. Coming to heating, a cubic metre of gas will furnish from 2400 to 4000 effective calories; whereas 1 kilowatt of electricity will only produce from 700 to 800. With regard to price, gas for lighting purposes costs roughly from 17·5c. to 25c. (say 1¾d. to 2½d.) per cubic metre; whereas 1 kilowatt-hour comes to from 7½d. to 10d. For heating and motive power, a cubic metre of gas costs 1d. to 1½d.; while 1 kilowatt-hour comes to from 2½d. to 3¾d.

Dr. L. Mond on Industrial Chemistry.

The address delivered by Dr. Ludwig Mond, as President of the Chemistry Section of the British Association meeting in Liverpool, was strictly confined to the history of the manufacture of chlorine. Yet it was well worth reading by others than those connected with the chlorine industry, as it throws much light upon many highly interesting points of theoretical and practical chemistry. In narrating the history of chlorine, Dr. Mond described the Weldon process, which results, among other things, in the production of what is now everywhere known as "Weldon Mud"—the peroxide of manganese. It is curious to note that, as a chemist, Dr. Mond readily admitted that Mr. Walter Weldon's success in modifying a process proposed thirty years before for the recovery of the manganese that had been used in the manufacture of chlorine, was probably due to the fact of his not being a chemist. Mr. Gossage in 1837 proposed to treat the residual liquors of this manufacture by lime, and to oxidize the resulting protoxide of manganese by bringing it into frequent and intimate contact with atmospheric air. The idea, with several patented modifications of it, was tried in various places unsuccessfully. Mr. Weldon, however, did succeed because, not being a chemist, he did not add the equivalent quantity of lime to his liquor to precipitate the manganese, but used an excess. Though no chemist at this time, Mr. Weldon soon made himself one, being a man of genius and of great perseverance; and he studied every detail of the reaction, with the utmost tenacity, until he had thoroughly established how this satisfactory result could be obtained on the largest scale with the greatest regularity and certainty. He even went further, and added considerably to our theoretical knowledge of the character of manganese peroxide and similar peroxides, by showing that these compounds possess the character of weak acids. Dr. Mond concluded his address with a reference to the production of chlorine by electrolysis; stating that though the theory was worked out by Faraday, it has taken all this time for the discovery to develop into the modern magneto-electric machine, capable of producing electricity in sufficient quantity to make it available for chemical operations on a large scale; for it must be kept in mind that an electric installation sufficient to light a large town will only produce a very moderate quantity of chemicals. Dr. Mond declared his disbelief that the easiest way of effecting chemical changes will be found in transforming heat and chemical affinity into electricity; tearing up chemical compounds by this medium in order that their constituents may re-combine in the forms we require.

Carbonate of Ammonia from Blast-Furnace Gases.—Mr. H. R. Lewis has devised a process for manufacturing carbonate of ammonia from waste blast-furnace gases; and the following outline thereof is taken from the "Journal of the Society of Chemical Industry." After passing through water or other cleansing liquid employed, the gases are forced, with those produced in the distillation of gas liquor, with steam into suitable condensers, where crystalline ammonium salts are formed. A continuous still is preferably used in distilling the liquor, to prevent the formation of a solution of ammonium carbonate as a distillate, which is liable to decompose. The residual gases are washed to prevent waste of ammonia. The ammonium salts obtained are exposed to a current of air to remove any sulphide; or they are washed with a little water and dried—thus ensuring that any ammonium carbamate present is converted into carbonate. This is converted into the more stable bicarbonate by contact with carbonic acid in presence of moisture, or by passing air or other gas over it—in the latter case with evolution of ammonia, which is collected.

Oil v. Cannel as an Enricher.—The manufacture of oil gas has been going on at the Southport Corporation Gas-Works for upwards of two years, under the supervision of Mr. John Booth, the Engineer and Manager; and a short time ago, he reported upon the matter, with special reference to the value of that gas for enrichment purposes as compared with cannel gas. He took for his purpose the working results for the four months ending in August last. The average yield per gallon of oil is 84 cubic feet of gas, the illuminating value of which is equal to 95 candles; this being equivalent to 6949 lbs. of sperm per ton of oil. The cannel coal supplied to the works yields gas which has an illuminating power of 26 candles, being equal to 936 lbs. of sperm per ton. Each ton of oil is therefore equivalent to 7½ tons of cannel. With regard to cost, a ton of oil comes to £3 17s. 4d.; labour and fuel cost 9s. 2d.—together, £4 6s. 6d. Deducting residuals, 4s. 2d., we have a net sum of £4 2s. 4d. The cannel equivalent of a ton of oil (7½ tons, at 16s. 4d.) comes to £6 2s. 6d.; labour, to £1 2s. 6d.—together, £7 5s. Deducting residuals, £2 14s. 8d., leaves a net sum of £4 10s. 4d., or a saving of 8s. per ton in favour of oil, at the present contract price.

TECHNICAL RECORD.

MIDLAND ASSOCIATION OF GAS MANAGERS.

Autumn Meeting in Birmingham.

The Autumn Meeting of the above Association was held last Thursday, at the Grand Hotel, Birmingham, under the presidency of Mr. W. R. Cooper (Banbury). The number of members present on this occasion "broke the record."

The President having expressed his pleasure at seeing such a large gathering of members,

The Hon. Secretary (Mr. C. Meiklejohn, of Rugby) read the minutes of the meeting held at Banbury in May last; and they were confirmed.

New Members.

The following names were added to the roll of members: Mr. W. Prince, of Stoke-on-Trent; Mr. Dixon Palmer, of Desborough; Mr. W. S. M'Gregor, of Longton, Staffs.; and Mr. J. S. Lucking, of Solihull.

Election of Office-Bearers.

The President said, with regard to the presidency for the ensuing year, the Secretary had, he was very sorry to say, received a letter from the Vice-President (Mr. Alfred Colson, of Leicester), stating that, in consequence of great pressure of work, he would be unable to accept the office of President. He much regretted that Mr. Colson was so pressed, and that they would lose his presence among them during the ensuing year. However, he (the President) was glad to say they had a gentleman who was willing to stand in the gap, and serve the Association; and he was sure that, in submitting his name to the members, it would be received with great pleasure. He begged to propose that Mr. John Young, of Etruria, be the President for the year.

Mr. B. W. Smith (Smethwick) seconded the motion, which was heartily agreed to.

Mr. R. O. Paterson (Cheltenham) was sure the name he had to submit for the vice-presidency would likewise commend itself to the members. It was that of Mr. J. T. Lewis, of Wellingborough.

Mr. W. Winstanley (Newcastle-under-Lyme) seconded the motion, which was unanimously adopted.

Mr. Lewis thanked the members; remarking that he hoped to worthily fulfil the duties appertaining to the office.

Mr. W. North (Stourbridge) proposed the re-election of Mr. Peter Simpson as Hon. Treasurer; and this, having been seconded by Mr. J. Tindall (Walsall), was carried.

The President said he was sure all the members were proud of the services that had been rendered to the Association by Mr. Meiklejohn as Hon. Secretary. All the duties that had devolved upon him had been discharged faithfully and punctually; and he therefore proposed that he be asked to continue to serve them for another year.

Mr. V. Hughes (Tipton) seconded the proposition, which was cordially agreed to.

The Hon. Secretary briefly acknowledged the kind way in which the members had recognized the services he had been able to render to the Association.

On the motion of Mr. J. F. Bell (Stafford), seconded by Mr. Taplay, Messrs. T. Glover and G. Helps were appointed members of the Committee.

Messrs. P. G. Winstanley (Nuneaton) and A. Cooke (Oldbury) were elected to the position of Auditors.

Mr. H. P. Maybury (Great Malvern) read the following paper, entitled—

NOTES ON A PNEUMATIC PAINTER.

The fact that I was the first manager to try the machine known as the pneumatic or brushless painter for gas-works purposes will, I trust, excuse me from what otherwise might be considered presumption in venturing to bring the working of the apparatus to your notice. In March of this year, I was in town, and saw a small model of the pneumatic machine; and I was so struck with the idea that I obtained the sanction of my Committee to give it a trial on my gasholders. These had not been painted for three or four years; and not only did they look anything but creditable, but corrosion was going on pretty rapidly.

As a result of negotiations with the Company, I got an impromptu plant sent down, together with two skilled men to start it to work. The usual red oxide paint was procured for the holders, and drab or stone colour for the columns and framing; and this was dealt with by the machine without difficulty.

As with all new things, a good deal of prejudice existed among the workmen, and by those who saw the apparatus at work; the criticisms being:—(1) That the paint went on too thick. (2) That it would run down the sheeting of the gasholder. (3) That it had not the gloss, as when done with a brush.

Up to the time of the trial at Malvern, the working of the machine had been almost entirely confined to light hand-power work—such as enamelling overmantels, painting and stencilling walls of residences, &c.—for which only some 5 or 6 lbs. of compressed air was required to work the spray; and consequently the plant to work with power generated by an engine was very incomplete. I connected an air-compressor (which had been borrowed) to a small portable vertical boiler, and got up in the latter a pressure of 20 lbs. per square inch. To this boiler was connected the flexible tube; and this in turn was connected to the paint container—a vessel holding about a gallon of paint—which was removed by the operator from place to place as required.

After getting fairly to work, I timed the machine (without the patentee's men knowing I was doing so), with the result that I found one spray was executing work at the rate of 130 square yards per hour; and upon putting a good man to work alongside the machine, I found that the latter got over at least ten times the work. It required great care to distinguish the work done by the brush as against that of the spray; while it must, of course, follow that with a pressure of 20 lbs., the paint must be forced into the seams of the sheeting and round the rivets very much more efficiently than when simply laid on with the brush. Within a day or so from the commencement of operations, I put two of the yardmen to manipulate the appliance; and with about an hour's instruction and practice, they got over the work as neatly and expeditiously as the patentee's men. During the nine days the machine was at our works, we painted a 60-feet and an 85-feet holder, each having two lifts of 25 feet, the horizontal condensers, vertical washer, three tower scrubbers, liquor tanks, &c., without having to remove the compressor or vertical boiler; and the finish of the work was all that could be desired.

Since that time the Company have designed a light portable plant, in three or four different sizes; and I have recently had an opportunity of seeing this at work. I am informed that one has been engaged in coating a holder in the Metropolis with tar; while another is now employed at Derby upon some bridge work.

At nearly all gas-works, an engine or engines have to be kept running, for exhausting and other purposes; and during the summer, when all yard work is done, the engine is running comparatively light. In these cases, it would be only necessary to get a compressor, fix it in or near the engine-room; and from this tubing could be laid under ground, in precisely the same way as a gas-service, having points about the yard—either in the form of stand-pipes, or covered with a chained lid—to which the unions of the flexible tube could be attached. Two men with an arrangement such as this would do the work of at least five (and possibly more), because experience teaches me that where you have a man painting, you must have another to look after him.

For those works where there is not power available, the Company have devised a portable engine, boiler, and compressor; the former indicating 5-horse power at 150 revolutions per minute, at 100 lbs. steam pressure, and being capable of discharging 29 cubic feet per minute of free air. The engine and boiler are so arranged that they can be used for any purpose other than that of compressing—such as pumping, driving coke or coal breaker, working lift to purifier-house, &c. This apparatus is mounted on wheels, and fitted with shafts, and is easily transported with one horse; the total weight of the engine being about a ton.

One of the great advantages of the pneumatic painter—apart from the actual saving in labour and paint—is the expedition with which it enables one to get through the work; and this

Pneumatic Painter, with Combined Portable Air-Compressor, Steam-Engine, and Boiler.

you will all agree is a very important factor. During the summer months, the gas manager is supposed by his committee or directors to be having a fairly easy time; but this—so far as my experience goes—is a long way from being the case. I am quite sure that, even in small works such as my own, if one is to keep pace with the times, keep the apparatus in order, and prepare for the inevitable winter, very little leisure is to be obtained. In large works it might be, of course, that the manager may, in order to keep his retort-hands employed, prefer that such work as painting should be done by them, even if the expense was somewhat more than if done by a machine; but to those who, like myself, are not in the fortunate position of having a small capital account, with whom to show even a margin of profit every opportunity of saving must be taken advantage of, I would commend, for such purposes as I have indicated, the pneumatic painter, for which I believe there is a future for all kinds of painting.

No doubt the subject I have endeavoured to deal with will be considered (and rightly so) only of minor importance, as I have always found that when other things were pressing, the one thing that can be, and is, deferred is the painting of holders, &c. Still, every manager taking an interest and pride in his works, cannot afford to be indifferent altogether to appearances.

To illustrate the importance attached to appearances by the outside public, I may say that about the time the "Painter" was at our works, the question of the erection of a new holder was under consideration; and the discussions and intentions of the Committee were duly recorded in the local press. A gentleman representing a large Birmingham house had, about a week or so prior to the painting operations, called upon me; and, as was his wont, he looked me up again on the occasion of his next visit, when he congratulated me upon the despatch with which I had been able to get the new holder erected—the one he was referring to being the old one brightened up.

Discussion.

Mr. J. T. Lewis (Wellingborough) inquired the cost of the apparatus.

Mr. G. Helps (Hinckley) asked if Mr. Maybury could give the members particulars as to the weight of the paint used for a specific number of yards of surface covered on the holders and lattice work; and also whether, if the columns and girders were latticed, he had found much waste in painting them in this manner.

Mr. J. C. Belton (Wellington) had hoped to hear something as to the comparative cost of working by this apparatus and by ordinary hand labour. If the author could give a little information on this point, it would be very useful.

Mr. S. Meunier (Stockport) wished to know if Mr. Maybury's experience had been sufficiently long to enable him to say whether the work done was as lasting as a preservative as in the case of hand work. The method employed should certainly drive the paint into every little crevice in the sheeting or ironwork; but did it seem to get into as close contact with, and have the same preservative effect on, the iron as when done by hand? With regard to the three criticisms mentioned in the paper, Mr. Maybury did not say whether any of them were found to be true or otherwise. He should like to hear what his experience had been in respect to them.

The President asked if Mr. Maybury was the only gentleman who had used this apparatus up to the present time.

Mr. Maybury said he believed Mr. Carpenter, of the Vauxhall Gas-Works, had used it for the coating of a holder. He was also informed that Mr. Pike, of Colchester, had bought the apparatus; and he understood he had put it to work.

Mr. T. Glover (West Bromwich) said that he believed most of the members had done something with steam-jets at some time or other; and one remembered having put a piece of sheet iron or a spade at different distances from a steam-jet, and seeing the effect of the spray. If one had only had the wisdom of carrying out this happy idea, he might have forestalled the Company who had put this apparatus on the market. But somehow or other one's wits were not always sharp enough. He had himself been struck with the effect of a steam-jet with tar playing on a piece of iron at different distances; and from what he had observed, he should imagine that this apparatus would, with paint of a suitable density, answer very well. He should like to inquire whether there was any difficulty in the jet stopping, or in having to keep the paint mixed; also if it had to be thinner than was usual with brushes, and the effect of putting it on at different pressures. He believed that 20 lbs. pressure per square inch was mentioned. By increasing the pressure or otherwise, would the paint be put on so as to last longer, or have a better coat or surface?

Mr. H. Taplay (Wellington, Salop) said he thought it was a well-established fact that in ordinary painting, two thin coats were better than one thick one, inasmuch as the first thin coat was allowed to dry and get hard before the second one was put on. He should like to learn whether the painting by the spray would be as durable and as good as paint put on in two thin coats. It was also an established fact that by the brush, they, as it were, tempered the paint—that was, like tempering mortar, a better setting quality was obtained.

The President said the author mentioned in his paper a difficulty which, he thought, many of them would experience in small works—of having to put their own men on one side from painting during the summer months in order to make room for the machine. He (the President) thought that, in his own case, it would make a great deal of unpleasantness if he had to send away in the summer men who were engaged in the arduous work of stoking during the winter, and who were now in the summer engaged in painting or other work. He thought it better not only for the men but for the Company that they should keep them employed in the summer.

Mr. Maybury, in reply, said the price of the apparatus would entirely depend upon the facilities which a works possessed for dealing with it. For instance, in works that had engine power (and he supposed most of them had that), all that would be necessary would be the laying of a service underground, and the purchase of the painting appliances in connection with the pneumatic painter. These would be the flexible tubing, the container, and the spray. The weight of the paint used in connection with the whole of the work, he believed, was about a ton altogether—at all events, they had four consignments of 5 cwt., but he was not sure whether they entirely used the fourth one. As to whether he had any difficulty with the spray in painting the girders and framing, he said that, by using a small spray, they did not lose much paint. Mr. Belton asked as to the comparative cost of painting by the spray and by hand. He calculated that it cost five times as much to paint by hand as by the machine—at any rate, that was so in his own case. His rough estimate of the total area covered was 80,000 square yards; and the cost of the whole, including his own time and that of the men in scraping and so forth, was about £40.

Mr. Belton: Does that include the whole of the apparatus mentioned in the paper?

Mr. Maybury: Everything. It included a 60-foot holder, with two lifts 25 feet deep each; an 80-foot holder, with two lifts of the same depth; a vertical washer, 20 feet high; horizontal condensers, about 600 feet; two liquor tanks, 30 ft. by 18 ft. by 4 ft.; and two tower scrubbers, of an average height of 28 feet. Of course, the estimate of 80,000 yards was an approximate one. Mr. Meunier asked as to whether the paint was as lasting in its effect as if put on with a brush. The painting was done in April last; and that morning he had an opportunity of looking at the work, and he could not see any great difference between that done by the machine and that done by the brush. The criticisms mentioned in the paper he thought were summed up by saying that the painting was everything that could be desired. Another inquiry was as to whether there was any difficulty in the jets stopping, or getting them to stop, and in the consistency of the paint. An examination of the jet he had present would show that it was quite easy to stop the painting at any moment; and as to the consistency of the paint, he used it just as he received it from the paint-works. The pressure employed did materially affect the area the painter could get over. To paint a holder required a pretty big spray; and a pressure of 20 lbs. must be used. Of course a smaller spray could be used, with 5 or 10 lbs. pressure, for the girders and columns; but 20 lbs. pressure was the minimum that could be employed with advantage. Regarding the increase or otherwise of the efficiency of the paint and its lasting qualities, he had only had the experience of this year; and therefore he could not say whether it would answer better or worse than paint put on by brush. He could not reply to the question as to whether two thin coats would have a greater lasting effect than one; but the holders and other apparatus painted were much improved in appearance, and a great deal of the corrosion going on in the case of the holders had been stopped. The President had alluded to the difficulty of putting men on one side in the summer months. He had also referred to this point in the paper; but in his own case, he had no occasion to discharge the men who served him during the hard winter months, as he had other duties than those of gas manager to perform, and was therefore able to find them employment.

Mr. T. E. Pye (London) then read his paper, as follows:—

THE INCANDESCENT FIRE-MANTEL.

The incandescent fire-mantel is an appliance designed to facilitate the combustion of non-bituminous fuel in the ordinary domestic fire grate, and thereby to secure a fire of pleasing appearance and thorough efficiency, which shall at the same time emit neither smoke, smell, nor any objectionable fumes whatever. Woods of all kinds, bituminous coal of the best or of the poorest description, anthracite coal or gas-works coke, will all burn with facility and intensity in any ordinary grate fitted with the fire mantel, while the addition of a limited percentage of the so-called non-combustible material such as spent oil-shale, cannel coke, &c. (say, from 15 to 20 per cent.) will not materially deaden or even affect the fire.

Of all the fuels just mentioned, there is no doubt that, in view of the claims made on behalf of the new appliance—viz., a smokeless fire, which is maintained at about half the expense of an ordinary coal fire—gas-works coke is the best suited for use under the system; and a varied experience of this residual, as employed in conjunction with the mantel, clearly demonstrates its utility for all ordinary purposes of domestic heating.

It is not claimed in connection with the appliance that in the domestic grate we find an actually new field for gas-works coke;

and, further, it is admitted that, in some few instances this fuel has been successfully employed by gas engineers and other technical men, in domestic warming, without an admixture of coal or other artificial aids to combustion. It will, however, on the other hand, be also readily admitted that, if the said field be an old one, it certainly has as yet been but little worked upon, and that, for all practical purposes, gas-works coke used alone is, as a popular domestic fuel, a conspicuous and certain failure. That if burned, under conditions suited to its proper and complete combustion, this fuel would prove an ideal one for such purposes has long been recognized by the most eminent authorities. Professor Ramsay only so recently as at the last Health Congress held at Glasgow University, pronounced most strongly in favour of the general use of coke.* I have, therefore, much pleasure in bringing under your notice this fire mantel; believing, as I do, that—providing what has for so long been required for the proper combustion of the coke—it is destined to do yeoman service for many a perplexed gas manager in assisting him in the profitable disposal of what is in many districts a positive drug on the market.

It is quite unnecessary to take up time at a meeting of this nature in arguing the importance of the considerations arising from what is practically the development of a new industry, and which, if one-half of the anticipations of the promoters of the system be realized, will almost revolutionize the present conditions of coke sales. These are matters which you will see for yourselves at a glance. You will also readily anticipate most of what I may say upon the chemical actions attendant upon the use of the appliance; and I propose therefore to ask your attention for the present more particularly to such practical issues as have already been decided, and to present data of actual experiences.

The fire-mantel is a simple contrivance, consisting of a frame carrying two rows of air-tubes.† The frame is placed inside and close up to the front bar of the fire grate. When the fire is in operation, these tubes convey into its interior at the two different levels, a supplementary supply of atmospheric oxygen. The carbonic oxide produced in the fire is thus met as generated by what may be termed the secondary air; the heat attending its conversion to the dioxide being utilized in raising to incandescence all the fuel in the immediate vicinity of the monoxide flame. By this means, a large amount of heat is obtained for useful radiation into the apartment (from the incandescent material) which, under ordinary circumstances, is in great part or wholly lost, as the well-known carbonic oxide flame usually noticed in considerable amount at the top of an ordinary coke fire—although an intensely hot one—gives out no sensible heat by radiation, and its useful heating effect is actually *nil*.

The place and action of the tubes should not be misunderstood. It is not claimed that the air currents toward the fire are concentrated on the tubes, nor yet that they themselves directly increase the air supply. They do so however, indirectly, as will be shown presently. What the tubes actually do is to convey a portion of the air while it still contains its normal complement of oxygen right into the heart of the fire; whereas the bulk of what oxygen enters the fire through the front in the ordinary way is quickly converted into monoxide and dioxide of carbon. Herein lies the secret of the brilliant combustion beyond the tubes, at a point which, without them, and especially in a small fire, represents an area of most incomplete combustion, and half black fuel.

The intense heat thus set up and diffused in every direction maintains a sharp upward current of air, which serves a twofold purpose. The heated products of combustion, supplemented by a large volume of rarefied air, and minus the usual complement of smoke and dust, and other clogging and weighty matter, possess a buoyancy which, so far as present experience goes, has invariably succeeded in overcoming the very worst of down-draughts in the ordinary chimney, while, as already explained, the carbonic oxide produced in the fire is already largely or wholly converted into carbonic acid. The only remaining fumes to be noticed—due to the sulphur in the coke—are thoroughly aërated in the fire, and wholly carried up the chimney; not the faintest trace being detected in the apartment. Another very important effect of the rarefied air current passing up the chimney is the suction induced at every point of the fire, drawing fresh supplies of air, and maintaining in the apartment a free and healthy circulation, which ensures a constant renewal of the atmosphere, and the removal of any deleterious gases that may be present in the room.

With reference to the cost of the fire, my own experience at home and at the Company's show rooms, shows a consumption of coke costing at present about 1½d. per day, and which will not exceed 2d. in the winter time. Coke is sold in London by measure; but I believe present prices range from 15s. 6d. to 16s. per ton inclusive. From these data, you will readily calculate the relative local cost of the fire. You will probably have already seen the figures given in this connection by Mr. George Lane, of Aylesbury, which are as follows: "For twelve hours' consumption of coke, it cost, at 4d. per bushel, 2d. to heat a room 15 ft. by 18 ft., maintaining a temperature 65° Fahr."

The manipulation of the appliance is as follows: Having filled in the bottom row of tubes, the mantel is placed in position just inside the fire bars. The fire is laid in the usual way with paper, wood, and coals. The top row of tubes are then inserted; and the fire is lighted. When the coal is well alight, coke is added, and is then used alone for the rest of the day. Where upright bunsen gas-burners are available, these will provide a ready means of starting the fire without the use of coal.

After referring to the experience of gas-works managers with the fire mantel, the author concluded by saying: If gas engineers will make known to the consumers the unique advantages of the fuel, the new possibilities of using it without unpleasantness and difficulty, and the facilities they have for delivering it at a moderate cost at the consumer's own door, broken ready for use, I am convinced that those of the members who hitherto have had but a poor demand will very soon reap profitable fruits from their new enterprise, which will go a long way to recoup losses on the ever-dwindling values of the other residuals, more particularly sulphate of ammonia.

Discussion.

The PRESIDENT, referring to the fire burning in the room to demonstrate the utility of the fire-mantel, said the coke had no doubt got incandescent much sooner than it would have done in a grate under ordinary circumstances. They were much obliged to the author for bringing before them this arrangement, because it would tend to remove the great heaps of coke they saw accumulating in gas-works. On the other side of the picture, however, there was the question whether the introduction of coke, and this new mode of burning it, would not interfere with the extension of their business in gas-fires.

Mr. J. F. BELL (Stafford) remarked that the increase in the consumption of coke for domestic use would be a great advantage to the gas manager; but it occurred to him whether the air-tubes would not soon be burnt away. The fire in the room was certainly a better one than it would have been without this arrangement; and, if the Company could guarantee that the fire-mantel would last a reasonable length of time, he thought it would be a great advantage.

Mr. TAPLAY said it frequently happened that at midday a large fire was not required in an ordinary room; and if one had to keep a fire going like the one before them, the heat would be intolerable, whereas with a gas fire, and to some extent with a coal fire, the heat could be moderated. But he could not see how the heat could be regulated with one of these appliances without pulling the whole paraphernalia down.

Mr. MEIKLEJOHN said he had had one of these fire-mantels in use in his Board-room for a short while, and therefore could speak from a little experience. In the matter of the regulation of the heat, he did not see that a coke fire presented any greater difficulty than a coal fire. If a large fire was not wanted, no further coke need be supplied to it. In his Board-room he had the fire lighted about 6.30 p.m. His Directors met at seven o'clock; and it was still alight at nine. No coke had been put on in the meantime; and as the fire burnt down, the amount of heat emitted was gradually reduced, until there were only small pieces of coke left in the bottom of the grate. He understood that these remaining small pieces of fuel were quite sufficient to set the fire going again. He therefore saw nothing in Mr. Taplay's point as to moderating the heat. He admitted that there was a great increase in the brilliancy in a coke fire supplied with the mantel; but he was not satisfied that by its means it was possible to make coke burn in every grate. He tried a smaller size mantel in his own office; but his impression was the depth between the mantel and the back of the grate was insufficient, as only a small body of coke could be used. In this case, he could not get a bright fire at all, and had to discard it in favour of a gas-fire.

Mr. MEUNIER stated that the previous day he had one of the fire-mantels fixed; but the fire had not been alight above an hour when he found one or two of the air-tubes had already split. He should like to know what was Mr. Pye's experience as to the life of the tubes. If the mantel brought about an increased use of coke, it would, of course, be an important thing. In his case, he had many gas-works round him; and consequently he had great difficulty in getting rid of coke; so that an increase in their sales would undoubtedly benefit the balance-sheet. The question occurred to him, however, whether, by introducing this fire-mantel, and increasing the consumption of coke, they would not be setting up some opposition, in the fact that they would also reduce the prices of coal. His greatest difficulty in obtaining good prices for coke was the fact that they were handy to the collieries, and the price of coal was low. He thought it would be better if they could get rid of the coke by other means, and try to increase the trade in gas-fires instead. Mr. Pye had been arguing from his experience down South, which was far different to the experience in the North.

Mr. C. E. JONES (Chesterfield) said that, as a user of coke for domestic and other purposes for upwards of 25 years, he was much interested in this paper. He contended that a coke fire was smokeless, and gave more heat than a coal fire. But they had to convince the public that these were facts; and to do so was very difficult, especially in towns near the coal-fields, where coal was in competition with coke. He maintained, after his long experience, that a coke fire could be controlled and ignited without any apparatus in front of it, and with equal

* The author here quoted from the address of Professor Ramsay as reported in the "JOURNAL" for July 28 last (p. 180).

† An illustration of the "mantel" appears on p. 875.

success. The chemical reasons that had been put forward in regard to combustion appeared to him to be insufficient. The same thing happened in any well-regulated coke fire, without the use of tubes at all. If he was correct in his reasoning, he could see no difference—the air passed through the bottom of the grate, instead of taking it in through the front bars. There was one advantage—if it could be called an advantage—that the air was conducted to the centre of the fire; but that would accelerate combustion, and lead to a greater consumption of coke. He was surprised that his friends in Birmingham had not taught the public to use coke. Some 17½ years ago, he read a paper before the Association on artificial lighting, especially in regard to public lamps; and Birmingham came in for a fair share of severe, but well-deserved, criticism on the state of her public lamps. But now he saw a wonderful improvement; and the engineers and authorities were to be complimented upon the magnificent change. If coke was broken to a size to suit the grate, after a little practice, one could easily light a coke fire without the aid of coal, and by wood alone. But the coke must be dry. He did not think there was much in the suggestion that, if they sold more coke, they would pull down the price of coal. Coal was cheap enough now; and from his point of view, it was too cheap. In his experience, he always paid the highest dividend when coal was dear, and the lowest when coal was cheap.

Mr. PYE, in reply, said he was pleased to hear that Mr. Jones had been so successful as to use coke in an ordinary grate without any special appliance. He must, however, remind him that the general public were not like him—they were not so enlightened on this question as gas managers were, and would not take any trouble. If they wished them to use a fuel that required special care, they must either prepare it for them, so that they could employ it without trouble, or they must be supplied with an appliance by which they could do the same thing. Mr. Jones said that coke was as manageable as coal. He (Mr. Pye) must differ from him here. Coke, in the hands of the general public, was not as manageable as coal by any means. He also said that the chemical reasons urged in support of the operation of the mantel were insufficient; and that any ordinary fire-place, with an open grate at the bottom, would supply all the air necessary. General experience did not bear that out. With reference to the regulation of the heat, Mr. Meiklejohn had handled that point; but he (Mr. Pye) would add this, that it was a simple matter to regulate the heat with a close-fitting fender in front of the fire-place, so that, by pushing it close, the grate could at once be converted into slow combustion, and, if an increase of heat was wanted, it could be taken away again. He was speaking from personal experience in his own house, where it was necessary to regulate the fire according to the prevailing temperature; and it was done with the greatest ease. As to the life of the air-tubes, gentlemen who had had them in use for eighteen months had told him that they did not get a dozen tubes broken in the season. His own experience was that the tubes once in the fireplace ought not to be broken; and he had not heard until now that the tubes were fractured in the fire. They were made of special qualities of fire-clay; and a lengthened use in the fire simply put a little glaze on them. With regard to the wire front, it did not get nearly so hot as would be imagined. In concluding his remarks, Mr. Pye said he wished to explain that he was present that day rather as a member of the gas profession, than as a trade representative.

Mr. T. GLOVER (West Bromwich) read the next paper, which was entitled—

COMMERCIAL TESTING OF GAS COAL.

If there is one thing more than any other upon which the successful operation of a gas-works depends, surely that one thing is the choice of coal. Coal is the base upon which we build; and if we choose well and wisely, the first step has been taken towards a good balance-sheet. It may be said that with good coals you must follow up with good management in other directions, if success is to be looked for; and this is no doubt true. What I desire to emphasize is the fact that the choice of coals is the starting point, which, if overlooked, no amount of attention in other branches of manufacture or distribution will make up for.

There are gas coals which have earned a good name, and may be looked upon as standards whereby to gauge other coals not so well known. The reputation of some well-known coals is deserved, seeing that year after year their merits have been tested in the most practical way; and so long as the price is kept at the normal market value, the gas manager may be excused if he gives a seemingly cold shoulder to the claims of new rivals. This confidence, however, may sometimes be carried too far; and if a test was made, the results obtained from some of the coals upon which we have placed so much reliance would sometimes cause no little surprise. When we consider the wide area over which our coals are mined, and the possible difference in locality from which the coal is obtained at the same pit, we can understand that the nature of a seam may be different when examined (say) at intervals of five years' time, owing to the altered position in the coal basin from which the coal is being mined. This is a good reason why periodical testings of all coals which are in use should be made.

Coal testing, however, to the manager who is wide awake, and who wishes to keep himself up to date, will not be confined to one or two favourite "brands" of coal; but if he is the happy possessor of a convenient testing plant, he will launch out into new fields, and it may be that his findings will be of considerable value to his undertaking. To illustrate this point, the author will venture to refer to an instance in his own experience. As is pretty generally known, most of the Durham coals are particularly free from sulphur; while the West Cumberland gas coals have not such a good character in this respect. At a gas-works situated at almost equal distances from the two coalfields, it will easily be understood that the coal which was relatively free from sulphur was almost invariably chosen, to the exclusion of the one which contained rather more than a fair share of this impurity. On the occasion of the opening of a new pit in West Cumberland, to work a well-known seam, the gas manager was prevailed upon to make a series of tests; and it was a pleasant surprise to find the gas and the residual coke contained only a low percentage of sulphur, while the yield of gas and illuminating power were such as to place it among first-class gas coals. The purity of the gas and coke in regard to sulphur was found to have been considerably improved by new methods of cleansing the coal from impurities at the colliery, with the result that a considerable percentage of sulphur, &c., was removed. Hence the reason for the improvement which was found in the quality of the gas and residuals. Other instances of the same kind might be quoted nearer home; but sufficient has been said to show the importance of looking at the subject with unprejudiced minds, and whenever possible verifying the information already possessed, as well as seeking to know the character of all likely coals which are offered.

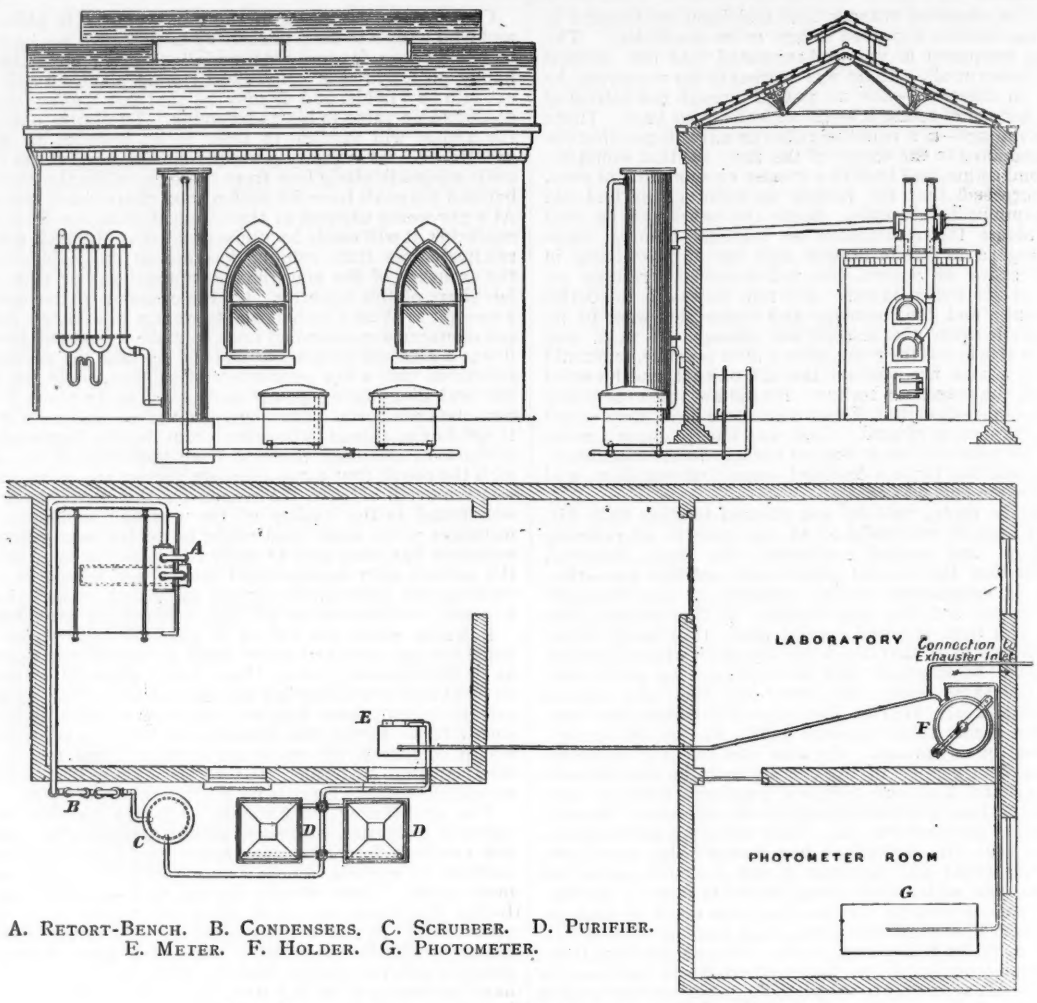
In works where the output of gas is from 10 to 50 million cubic feet per year, and where there are no stringent conditions as to illuminating power, there is no difficulty in making a 12 or 24 hours' working test any time of the year. In works of greater output, there may be considerable difficulty in making such a test. Hence the necessity for having a separate plant, where comparatively small quantities of coal may be dealt with; and no moderate or large sized works can be regarded as complete where there is no experimental test plant.

The coal-testing plant should as far as possible be a gas-works in miniature, with every facility for measuring accurately the products from the coal under test. The conditions and methods of working should be similar to those practised on a large scale. There should always be more than one retort within the bench, so as to allow the retorts to be charged alternately. In this way, the light gases from one charge are mixed in the hydraulic with the heavy gases from a new charge; and the process becomes similar to that which experience has shown to be the best for ordinary working. With a test plant similar to the one about to be described, it is possible to make two, and at a push three, tests a day. The weight of coal used per test would be from 2 to 3 cwt. The results, therefore, would be of much more practical value than those obtained by the distillation of a few pounds. If circumstances will allow, it is an advantage to have such a test-works in close proximity to the manager's laboratory, so that the assistant who is engaged on the chemical analysis of the coal, coke, gas, &c., may supervise the work of drawing and charging, and be ready to take the photometrical tests at the right time.

The three great factors (exclusive of price) which control the choice of coals, may be said to be yield of gas by volume, illuminating power, and weight and quality of coke. To facilitate comparison previous to buying, when a large number of tests are made, it is advisable to reduce these three items to one figure—viz., cost per candle-thousand. This is arrived at by dividing the cost of the coal in pence, less the value of coke, by the candle-thousands. The value of tar and liquor are purposely avoided for this calculation, because of the difficulties of estimating their true volume.

Working two retorts similar to those shown on the diagram, the testing would be commenced by putting in a light priming charge, for the purpose of clearing the pipes and apparatus of air or stale gas. A carefully weighed charge of ½ cwt. would then be put in, and the time noted. In an hour afterwards, the second retort would be similarly charged. At the third hour, the first would be drawn and charged again; and so on, until, with steady production each hour, the yield has been accurately decided. Each charge of coke is weighed hot, so that no inaccuracies occur through water being absorbed in quenching. The state of the meter taken every hour gives the production from ½ cwt. of coal, from which the production per ton is readily calculated. The temperature at which the gas is registered should, of course, be carefully noted, and corrections made.

The illuminating power may be taken every two hours; and the average of these tests may be regarded as reliable. The gas for testing purposes may be collected in a 10 cubic feet capacity gasholder within the laboratory; the bulk of the gas being passed on to the town mains, or preferably to the inlet of the works exhauster. A holder of sufficient capacity to contain the whole of the test gas is thus dispensed with; a sample stream being constantly taken off into the laboratory holder. This method of collecting samples of gas is not only useful with a test plant, but will be found equally valuable when it is desired to find the illuminating power of the gas from the works over any period. A carefully regulated stream—say, 2 cubic feet per



A. Retort-Bench. B. Condensers. C. Scrubber. D. Purifier.
E. Meter. F. Holder. G. Photometer.

Coal-Testing Plant at the West Bromwich Gas-Works.

hour—being supplied to the test holder, care should be taken in any case not to have a long length of supply-pipe, without providing means to get a good stream to flow through it. When a works' test of a sample of coal is being made, the small holder has many advantages over the old system of using a large holder; and the tests could be made more frequently, and would therefore be more reliable.

The three chief items which control the value having been decided, other important items of information will be obtained in the laboratory. These are: Specific gravity, sulphur in the volatile products, sulphur and ash in coke, and the calculations in regard to sperm value. These facts properly tabulated, along with the price and cost per candle-thousand, will enable the gas manager to decide at once upon the coal having the most advantages for his purpose; and with a plant such as the one described, the manager of any moderate sized works may have information which will be of far greater value than that sometimes submitted on elaborate sheets of analysis.

It will probably be found advisable to make a comparison of the results which can be obtained on a working scale, when the plant is in an average condition, with those produced in the test works; and, if necessary, an allowance can be made for the difference.

This somewhat discursive paper may be summarized as follows:—

1.—It is advisable to test well-known coals periodically, and an advantage to have facilities for making rapid but accurate tests of all suitable coals which are offered.

2.—For this purpose, in moderate and large sized works a test plant should be provided.

3.—It is not necessary in such a plant to collect the whole of the gas from the coal under test in a large holder; a sample of (say) 10 cubic feet being easier to manipulate for accurate testing.

4.—The results from such a test plant should be compared with those made on a working scale, so as to arrive at the results which might be expected when the coal was used under ordinary conditions.

[Mr. Glover appended to his paper his suggested design for a book in which to keep a record of coal tests. It consisted of 17 columns, having the following headings: (1) Date, (2) Name of Firm, (3) Description of Coal, (4) Price per Ton of 2240 lbs., (5) Weight of Coal Used, (6) Gas Made in Cubic Feet at 60° Fahr., (7) Gas made per Ton at 60° Fahr., (8) Weight of Coke per Ton of Coal in Pounds, (9) Value of Coke per Ton of Coal at Market Price, (10) Cost of Coal, less Value of Coke, (11) Illuminating Power in Standard Candles, (12) Cost per Candle-Thousand, (13) Sperm Value per Ton of Coal, (14) Sulphur Eliminated with Volatile Products, (15) Sulphur in Coke, per Cent., (16) Ash in Coke, per Cent., (17) Specific Gravity of Coal.]

Discussion.

The President said Mr. Glover had spoken on an important subject, which, as he had remarked, was the basis of all their prosperity as gas managers. They all knew it was an important matter that they should procure the coal best adapted for making gas in the greatest quantity, and of the highest quality, and producing the most valuable coke. He (the President) did not quite see the good of the small holder; and in most works he thought they could make arrangements in one of the end settings for the testing of the coal. But Mr. Glover had tried both plans, and preferred the system described. He thanked him for his valuable suggestions.

Mr. C. E. Jones (Chesterfield) did not feel disposed to join issue with the general conclusions Mr. Glover had drawn; but there was one point to which he decidedly objected, and on which he should like a little more information. It was this, that he could not see the advantage of taking away a portion of the gas from the coal under observation, and conveying it to a small holder for testing the illuminating power. He thought such a process was entirely misleading. In certain experiments he conducted some time ago in connection with mines and explosions of gas therein, he was led into a study of the time required for the proper intermingling or diffusion of gases among themselves, and especially with an admixture of atmospheric air. He found several hours were needed to bring about the diffusion of gases of different specific gravities in the same holder. The same point was thrown out by the Committee appointed by the Board of Trade to determine the standard for the testing of the illuminating power of gas. They allowed the gas to stand in the holders for several days before they attempted to use it, in order that they might get correct results. He should prefer to put all the gas in the coal into one holder, and not take a stream from it as it was being manufactured. He should then allow it to remain in the holder at as

light a pressure as possible, in order to get absolute diffusion—a homogeneous mixture—before he took the illuminating power. He had tested nearly every coal in the Midland counties; and he did not think the suggested process any advantage over the system he had commonly in use. It was important that they should keep the test going. It was evident this was the proper thing to do if they wished to get a good coal, of uniform quality. He could bear testimony to Mr. Glover's assertion that coal was better screened now than it used to be; and some of the coals that had had a bad reputation for impurities had redeemed themselves in that respect, while other coal that had had a high reputation for good qualities had deteriorated very largely. The question dealt with by the author was undoubtedly a most important one; and it was one well worthy of being thrashed out.

Mr. R. O. Paterson (Cheltenham) said that, as the son of his father, he felt a great interest in any article or paper bearing upon the testing and the analysis of gas coal. Since his father's death, he had been largely occupied in the analyzing of coal for gas making; and he could bear testimony to the great necessity there was for constant and regular supervision in the work. As an instance of this, he might say that only very recently he had an opportunity of testing coal from two beds of the same seam within a short distance of each other; and it would be a rather startling piece of information if he laid before the members the different results obtained in the testing of the coals of these two beds, although both coals were coming from the same seam, within practically a stone's throw of each other. This was one variation that took place in a coal; and it was only one. He could give numerous instances which would point very strongly to the necessity of careful and regular testing of the coals used. Doing this constantly himself had been the means of saving his Company a very considerable sum of money. Mr. Glover's paper, he thought, was entitled "Commercial Coal Testing." He (Mr. Paterson) did not know to what extent Mr. Glover's process would be classed as a commercial testing, any more than the one he himself had adopted, and which he must say, in all humility, he considered was vastly superior to that which the author had described. It was a very common thing to say that one could not test coal by using a few pounds' weight. Perhaps some could not do so; while others said there was no impossibility in doing it, and it could be done with a vast amount of regularity and correctness. There were ways of doing it, and ways of not doing it. In the apparatus before the meeting, Mr. Glover had departed from the usual conditions of things that existed in gas-works in the ordinary course of working; and he had no more nearly approached a commercial analysis—in the sense of the analysis being a direct and simple unit of the actual manufacture of gas at a particular works—than an analytical testing. For instance, he had no exhauster; and they well knew what effect that had upon the practical operations of a gas-works. There was another point which he should mention—that either Mr. Glover must use an iron retort in this particular apparatus, or, if he used a clay one, it must be, from the irregularity of its working, an unsatisfactory test altogether. Therefore, he should attach little faith to it under these conditions, so far as the yield of gas was concerned. The next point was the quality of the gas; and he should most distinctly have great doubt in carbonizing for an illuminating power test by such appliances as the author had put before them. Supposing Mr. Glover collected all the gas into a small holder, it was impossible for him to say that the illuminating power of one or two tests represented the value of the gas in the holder. It was well known now that gas did stratify in a holder; and they would have to practically exhaust the holder before they obtained the average illuminating power of the gas contained in it, when it was worked under the conditions proposed by Mr. Glover—he, of course, meant from a manufacturing point of view. He (Mr. Paterson) always used two holders in his laboratory work. Having made the gas, he sent it into one holder and measured it; and then carried it into another holder (through a sufficiently small pipe to cause it to go in under pressure, so as to make it intermix) before he attempted to test the illuminating power. If he took the illuminating power in the first holder, he would have to keep working down the holder to get a continuous test; and he would, perhaps, get an average of what the holder contained. This would be waste of time; but, by sending the gas into a second holder, he obtained a correct test of the illuminating power. He should utterly discard or discount the correctness of an analysis from apparatus of the description before them. Mr. Glover discarded the value of the ammoniacal liquor and the tar, which was by no means an insignificant omission, especially as they might find in some cases (as he himself recently found) that a coal contained no less than 60 gallons of ammoniacal liquor to the ton. This was a very serious matter, on account of the effect this volume of liquor would have upon carbonization. Matters of this kind they would observe carefully in such an apparatus as he (Mr. Paterson) used; but he did not think they would be able to do so in Mr. Glover's apparatus. Such a quantity of liquor as he had mentioned had such a bearing on the action of the retort as to reveal some points of considerable interest that would be overlooked in Mr. Glover's apparatus. The impurities in coal, so far as he had been able to detect, could be, with very great accuracy indeed, ascertained with a small apparatus. The amount of sulphur in the coal could easily be obtained with small apparatus; and the quantity of sulphur in the volatile products and that remaining in the coke could be ascertained with the greatest accuracy. The impurities which were originally in the coal, and were visible in the form of pyrites, were not the only form. He could point to coal that was absolutely clean to all appearance, but when they came to carbonize it, the impurities were very soon revealed; so that it did not follow they would be seen in the form of pyrites.

Mr. G. Helps (Hinckley) asked if Mr. Glover obtained a regular heat with the setting of two retorts, and whether he had compared it with that of his ordinary settings. He was interested in the continuous testing of coal, because his experience had always been that even coal from one pit, taking the carbonization over twelve months, was continually varying. In his own case, he had found the make varied by 500 to 600 cubic feet, and yet he did not see any great difference in his heats. He put it down, to an extent, to the ever-varying back pressure, caused by the different quantities they were making from time to time. But, by putting some old hydraulic to an old stack, he went into this question, in order to find some means of continually testing the coal. The conclusion he came to was that he would connect up one retort in each bed with a special bridge and dip pipe; the dip-pipe having an ordinary cone valve attached, actuated by an outside screw. This was how he was fitting up the beds; and he would then be able to test the quality of the coal from any bed he might be using. He could either bye-pass the gas through the test apparatus or not test at all. Of course, in this manner, he hoped to obtain the actual working test, as the retort he would be using would be in the bed he had in operation for the ordinary carbonization.

Mr. Glover, in reply, said if the paper had had no other purpose than getting their friend Mr. Paterson to speak, he was himself amply rewarded. The name of Paterson, in connection with coal testing, was one that they all certainly respected. Mr. Paterson had been very kind in some of the remarks he had made on the subject; and he spoke of an example he had had lately of the difference in two samples of coal obtained from the same seam only a short distance from each other. That was testimony which he very much valued. Then Mr. Paterson went on to criticize the system; and he was not at all surprised that he did so. He himself knew it was open to a great deal of criticism. It was a departure in some respects from the usual methods of testing small samples of coal. He (Mr. Glover) attached a good deal of importance to the fact that he dealt with the coal more like they did in the ordinary retort-house. He did not simply put in a charge of a few pounds of coal, and collect the whole of the gas, and then take special means of getting the gas mixed; but, with the system he had suggested, the gas would be evolved from the coal under test from more than one retort, at different stages of carbonization at the same time, and stratification would thus to a great extent be avoided. In regard to the criticisms as to the small holder, he did not think that, if it was tried, it would be found to have the vices that had been attributed to it. They could test all the gas from the holder in a short time; and as the gas was collected over the whole of the time of the test, it ought to contain, and he believed it did contain, a fair sample of the gas which was being made. In regard to discarding the tar and the liquor, they all knew a great deal of tar went forward to the scrubbers. It was so in ordinary practice; and it was so in testing-works. If they did not scrub the gas, they had the ammonia in it; while, if they did scrub it, they had a lot of liquor, which could not be very well estimated. They had also a great deal of tar which they could not estimate. How they were to arrive at it quickly enough and accurately, he really did not know. To this matter, Mr. Paterson attached much value. Coal that did not contain pyrites might, he also said, contain a great deal of sulphur. This, he (Mr. Glover) thought, they had all found; and they had also found that latterly, in modern collieries, they had the power of removing a great deal of the sulphur, and rendering coals which at one time they were unable to use suitable for gas manufacture, even where coke had to be made practically free from sulphur. His object in reading the paper was not to teach the fathers of the gas industry how to test coals; but to put before the members a plant which he had found to be of great advantage at his works, where they made from 200 to 300 million cubic feet of gas in the year. If gentlemen who had works of like dimensions, or even less, would put in testing plant of this size, they would find it of much benefit. Mr. Helps had spoken of the heats of the retorts. They might be kept very regular; and if the retorts were made of suitable iron, the heat approximated to what it should be with ordinary clay retorts. There was no reason why an exhauster should not be used with the plant. It would be a very simple matter to put in a small steam-jet exhauster. There was also no reason why brick retorts should not be employed with a steam-jet exhauster on the inlet or outlet of the purifiers.

Votes of Thanks.

On the motion of the President, seconded by Mr. J. T. Lewis (Wellingborough), the best thanks of the members were accorded to Messrs. Maybury, Pye, and Glover for their contributions to the proceedings.

Mr. Charles Hunt (Birmingham) said that it was his privilege to propose a vote of thanks to their retiring President.

It was unnecessary for him to expatiate upon the tact and courtesy of Mr. Cooper in presiding at the meetings, nor need he say how much the members were indebted to him for his care of the Association during the past year. Those who were fortunate enough to visit Banbury in May last, could also bear testimony to the great hospitality and excellent arrangements which he then made for their comfort and enjoyment.

Mr. PATERSON seconded the proposition, which was carried by acclamation.

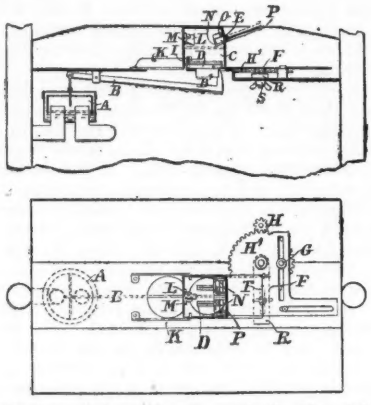
The PRESIDENT thanked the members very heartily for their kind expression of approval of the manner he had been able, by their forbearance, to carry out the duties of the office.

This concluded the business; and a few minutes later "high tea" was served to the members.

REGISTER OF PATENTS.

Coin-Freed Mechanism for Gas-Meters.—Gamwell, H. and C., of Liverpool. No. 18,448; Oct. 3, 1895.

Coin-freed mechanism under this invention consists of a valve controlling the passage of gas into the meter; a lever for opening the valve, actuated by the prescribed coin; and a push-piece operated from a moving part of the meter—such as the index-spindle—for removing the coin and releasing the lever when the required quantity of gas has been passed.



In the illustrations, A is a lift-valve with liquid seal for controlling the passage of gas into the meter; and B is a lever for actuating the valve. One end of the lever is situated under, and extends into, the box C, so as to be capable of being depressed by the weight of a coin D inserted through a slot E. When the lever is thus depressed, the valve is opened and gas can pass into the meter. F is a push-piece having reciprocating motion imparted to it by the crank-pin G, and pinion and wheel gear H H¹ from any moving part of the meter. The piece F pushes away the coin from above the lever, through an opening I in the box C, and allows it to drop into a receptacle placed at any convenient part of the meter. When the coin is being pushed away, the end of the lever is held down by the push-piece until it has returned to nearly its normal position, when the end is released, and is free to be raised by the weight of the valve A or by a spring as desired. The end of the lever is formed with a curve or wedge bearing against the push-piece, so that the end is slowly raised and the valve gradually closed; or a fly or other suitable device may be used to prevent the valve being suddenly closed. K are springs, the ends of which pass into the box C and have notches in them only large enough to allow one coin to pass at once. If the coin is bent, the springs give way either laterally or vertically, and allow it to pass, while preventing the passage of other coins at the same time. L is a stop-piece, preferably on a pivot M, to prevent the parts being jammed by too many coins being inserted. When sufficient coins have been inserted to fill the box to the underside of the stop-piece L (as shown by the dotted line), any further coin inserted is prevented from completely entering by coming against the stop-piece. N are catches pivoted at O. P are projections on one side of each catch. When a coin of the proper size is inserted into the slot E, the sides of the coin press against the projections P, and raise the catches N so as to allow free passage to the coin; but if a coin of less dimensions is inserted, the edges of it do not press the projections (or only one of such projections is pressed), consequently the catches are not raised (or only one of them is raised), and the passage of the coin is prevented. The spur-wheel H is carried on an arm R, secured by a screw and winged nut S. The arm R is moveable in a slot T, so as to allow of wheels of different sizes being used according to the quantity of gas which it is desired to pass for each coin being pushed from the box.

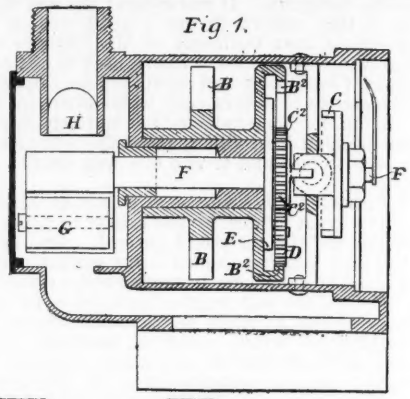
Prepayment Gas-Meters.—Hawkyard, J., of Saddleworth, and Braddock, J., of Oldham. No. 18,815; Oct. 8, 1895.

This invention in prepayment gas-meters consists in the combination of a primary shaft directly and positively connected to the gas-admission valve, with an epicyclic train of gearing, and means for operating one of the gearing wheels (either by a coin or token or by hand) to set the apparatus to deliver a certain amount of gas, and another of the gearing wheels by means of the meter mechanism to close the gas-valve.

Fig. 1 is a section through about the centre of the valve-box casing and the mechanism hereafter described. Fig. 2 is a view of the valve-box end with the end-plate removed. Fig. 3 is a view of the other end thereof. Fig. 4 is a sectional view. Figs. 2, 3, and 4 are drawn to a smaller scale than fig. 1.

The coin-receiver (not shown) is substantially as described in patent No. 14,655 of 1890; but the boss of the ratchet-wheel B, upon which the coins act, carries at one side an internally toothed wheel B^2, instead of a circular cam or inclined plane. The first motion-wheel C is driven from the meter by a pinion and spindle like that described in patent

Fig 1.



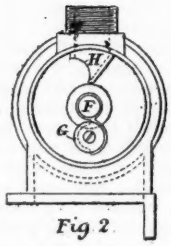


Fig 2

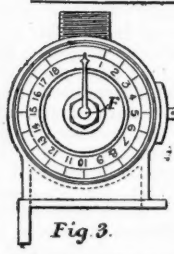


Fig 3.

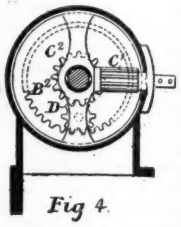


Fig 4.

No. 9771 of 1893. Inside the wheel B^2, is a spur-wheel C^2 attached to the first motion-wheel; its diameter being so arranged as to admit of a pinion or wheel D being placed between, and gearing with both the internally and externally toothed spur-wheels B^2 and C^2. This pinion or wheel D is mounted upon an arbor, carried by a disc E, secured to the central spindle or shaft upon which the ratchet-wheel B and first motion-wheel C are loosely mounted, and revolve in opposite directions.

The action of the ratchet-wheel B moves the pinion or wheel D in one direction, while the action of the spur-wheel C^2 attached to the first motion-wheel C moves it in the opposite direction. An oscillating motion is thus produced, which is transmitted through the spindle or shaft F (owing to the disc E carrying the arbor of the pinion D being securely mounted on it); and this motion is employed to open and close a valve G—controlling the gas supply to or from the meter—fixed upon a radial arm, and working from and to a seating H. Or the motion of the spindle may be applied to operate an oscillating slide-valve, or (by means of a rack and pinion) an ordinary reciprocating-valve or slide-valve.

Gas Motor Engines.—Lister, F., of Keighley. No. 20,703; Nov. 2, 1895.

This invention refers to means for automatically supplying water to the cylinders of gas-engines when the temperature attained therein, or in any other part, exceeds a given degree—the water being by the heat of the cylinder converted into steam, and at a time when it is most beneficial as a motor for the piston—"thus, while it reduces the temperature thereof, it also utilizes the heat."

In a single-acting engine, the admission of water could be arranged to take place in the alternate cycle to that in which the gas is used, or at every third, fourth, or other proportionately and relatively arranged rate of supply. Instead of the water being admitted at prearranged intervals, its supply might be governed by heat-indicating mechanism. A copper or other metal tube in connection with the cylinder, or a column of mercury, or other liquid, metal, or gas could be used; these being so arranged, and the parts in connection with them so constructed, that on the temperature of the cylinder exceeding a certain degree, their expansion would open a valve or otherwise act so that the water would be admitted as desired.

In a single-acting engine, the water never would be supplied to the cylinder simultaneously with the gas, nor at any time while an explosive mixture was in the cylinder; the mechanism for admitting the water being arranged so that when it operated it also would operate to prevent the admission of gas.

In a double-acting engine (or one in which the cylinder is closed at both ends), the action of the water and gas is exactly the same—one end of the cylinder being considered as distinct and separate from the other, so far as its cycle of actions are concerned. Or one end of the cylinder might be used exclusively for the gas, while the other was used for water.

Prepayment Gas-Meters.—Hawkyard, J., of Saddleworth, and Braddock, J., of Oldham. No. 21,429; Nov. 12, 1895.

The claims for this invention are: 1. In prepayment gas-meters the combination of a spindle capable of oscillating two bevel or crown wheels loose upon the same axis or central line; a pinion between, and in gear with, them mounted upon an axis radial with regard to the spindle, and carried by a disc or its equivalent fixed upon the spindle and oscillating therewith; change gear between the meter mechanism and one of the loose bevel or crown wheels; means for actuating the other crown-wheel (directly or indirectly) by hand or by a coin or token; and a valve actuated positively by the oscillating spindle to admit or cut off the gas. 2. The combination with a valve actuated

positively by a wheel set by a coin or token, or by hand to open the valve, and by a second wheel worked by the meter mechanism to close the valve, of an intermediate pinion completing the train of epicyclic gear for these operations—such pinion being carried by a disc or its equivalent fixed on the spindle which moves the valve, the disc or equivalent being provided with a rim or ring marked so as to indicate through an opening in the casing of the mechanism the quantity or value of gas to pass before the valve is closed upon its seating.

Fig. 1.

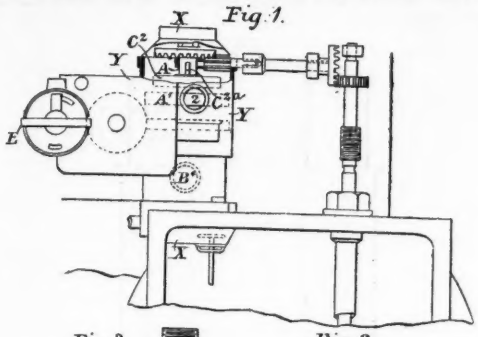


Fig. 3.

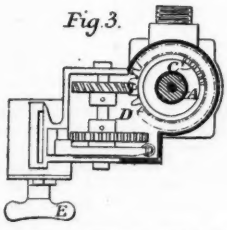


Fig. 2.

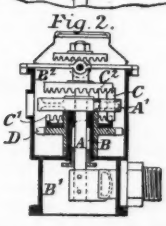


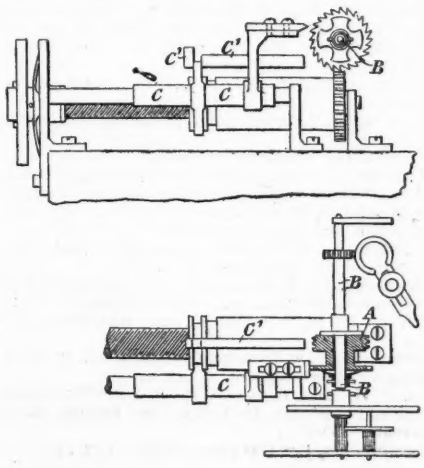
Fig. 1 is an elevation, partly in section, of apparatus constructed according to this invention. Fig. 2 is a vertical section through about the line X of fig. 1. Fig. 3 is a horizontal section through about the line Y.

A is the valve-spindle passed through the stuffing-box B, separating the valve-chamber B^1 from the casing B^2 of the rest of the apparatus. A^1 is the disc carrying the pinion C, which gears with a crown-wheel fast on the boss of the wheel D, which revolves loosely upon the fixed boss through which the spindle A passes. The wheel D may be indirectly actuated by a coin in a receiver (similar to that described in patent No. 14,655 of 1890) turned by the handle E. Each coin inserted causes the wheel to make part of a revolution actuating a screw-wheel, which gears with the wheel D, and causes it and the crown-wheel to make part of a revolution. The crown-wheel C^1 gears with the pinion C, which also gears with the crown-wheel C^2. This wheel is loose on the spindle A, and driven by a changeable crown-wheel; the boss of the latter being slotted to receive projections from the wheel C^2. The changeable wheel receives its motion from a pinion driven from the meter mechanism, as described in patent No. 9771 of 1893. The wheel C^2 is held stationary when the meter is not at work; and thus the wheel C is caused by the wheel C^1 (when a coin is put in the receiver, and the latter is caused to make part of a revolution by the handle E) to roll round the crown-wheel C^2, and carry the disc A^1 with it.

The disc A^1 is made with a suitable rim marked with numerals (say, 0 to 12) upon its peripheral surface; so that if the wheel D is caused to make one-thirteenth part of a revolution, twelve pennies can be inserted into the apparatus, and the numeral 12 will show through an opening in the casing. The number shown will indicate the value of the gas to be passed through the opening before the valve on the spindle A closes it.

Prepayment Gas-Meters.—Cowan, W. and W. H., of Edinburgh. No. 22,763; Nov. 28, 1895.

This invention has for its object "to prevent a difficulty or inconvenience which may arise in connection with coin-freed prepayment gas-meters when the stop-valve, though closed, is not gas-tight. In such cases, the continued passage of even a very small quantity of gas may result in the forcing and derangement of the prepayment mechanism; and it is to obviate this that the present invention has been devised."



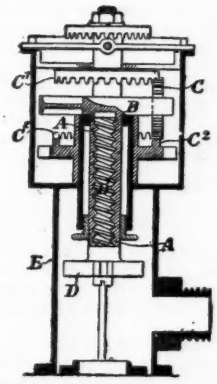
The illustrations show an elevation and a plan of the invention applied to the mechanism described in patent No. 21,108 of 1894.

One of the gearing worms A of the meter mechanism is constructed so that its hold or grip upon its shaft B is due to a spring, which is capable of being forced, in order to enable the worm A to be held by the prepayment mechanism while the driving shaft B, which carries the worm, continues to revolve. The worm is also provided with a notched or toothed disc, against or into the edge of which a travelling stud or bar, mounted upon the travelling tube C which carries the valve-closing track C^1, comes on each occasion that the valve is closed. The stud or bar is preferably provided with a slot, and is secured by screws so that it is capable of being adjusted as required. The worm is kept in contact with the spring by a collar secured to the shaft.

The action of the arrangement is such that, as soon as the valve is closed by the track C^1, the stud or bar engages with the teeth upon the disc of the worm A, thereby preventing, should the valve be leaky, any forcing or derangement of the prepayment mechanism.

Prepayment Gas-Meters.—Hawkyard, J., of Saddleworth, and Braddock, J., of Oldham. No. 23,388; Dec. 6, 1895.

The principal feature of this invention (which is applicable to either wet or dry gas-meters) is the mounting of the roller wheel or pinion of an epicyclic train upon a disc or arm attached to or forming part of, or which actuates, a sleeve or tube working upon or in a corresponding threaded spindle or tube free to move longitudinally, which movement is employed to open and close a valve controlling the gas supply to the meter. If the valve is attached to the end of the spindle or tube, its rotation along with the screwed spindle or tube may be prevented, and a longitudinal movement secured, by projections or snugs sliding in or upon grooves or projections in the valve box or chamber. To arrange for variations in the price of gas, the meter-driven wheel of the epicyclic train is connected to a crown change-wheel driven by a long fixed pinion, as represented in patent No. 9771 of 1893. To show the amount of gas prepaid but unconsumed (or the position of the valve), an indicator is actuated from either the screwed spindle or the screwed sleeve.



The illustration shows a sectional elevation of a train of epicyclic gearing C C^1 C^2. The disc B carries the rolling pinion C of the gearing, fixed upon a spindle A, part of which is in the form of a sleeve screwed internally; also a valve D at the end of a spindle D^1, screwed to fit in the sleeve or tubular part of the spindle. The wheels C^1 and C^2 may be actuated by means similar to those described in patent No. 21,429 of 1895; and it will be seen that the valve D can be raised by the action of the coin-driven wheel C^2, and returned by the wheel C^1. The valve-spindle D^1 works up and down in the sleeve A, as it is prevented from rotating by a projection or a groove at each side working in or on a corresponding slide in the wall of the valve-chamber E.

Gas and Other like Engines.—Sales, G. de R. de, of Lyons, France. No. 23,417; Dec. 6, 1895.

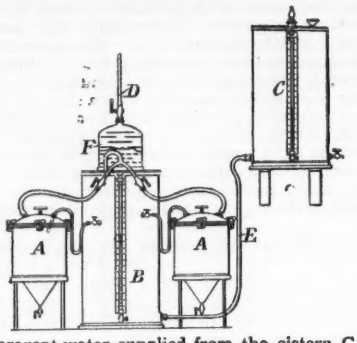
This invention has reference more particularly to the formation of the piston of a gas-engine with a concave surface, in such a manner that "the useful gas is kept separate from the burnt gases of the previous explosion." According to one construction, the face of the piston is made hollow or concave—approximating to the form of a spherical or a parabolic mirror; and around its edge is formed an annular channel or rebate. The inlet for explosive mixture is placed centrally of the cylinder end, so that the mixture when drawn in may spread itself out in the form of a cone and displace the residual or spent gases towards the cylinder wall. The object of this construction is that "the molecules of the explosive mixture may be struck by the 'reflecting' surface of the piston, and thereby compressed towards the axis of the cylinder, while the spent gases, acted on by the annular channel or rebate, remain around the peripheral space near the cylinder wall, where they form a non-conducting layer." In some cases, the gas-inlet may be at or near the edge of the cylinder cover; the "reflecting" surface of the piston being modified so that its axis will still pass through or near the inlet.

Producing Acetylene Gas.—Ackermann, F. P. J., of Marseilles. No. 14,278; June 27, 1896.

This apparatus for making gaseous acetylene is based on the utilization of the oscillatory movement of water in a fixed gasholder; this movement being determined by the difference between the production and consumption, with a view to regulate automatically the quantity of water necessary to produce the acetylene.

An illustration is given of apparatus in which the holder B is combined with two generators A; the water connection being at different levels, in order to obtain an uninterrupted working of the apparatus.

Suppose that the tube of the left-hand generator enters the holder at a lower level than the tube of the other generator, the former will work only such time as it will take to exhaust the charge of carburet. Then it will fill with water; and the water-level in the holder will rise to the other connecting-pipe, and the right-hand generator will work. The continuous production of acetylene can thus be assured; one generator being recharged while the other is working.



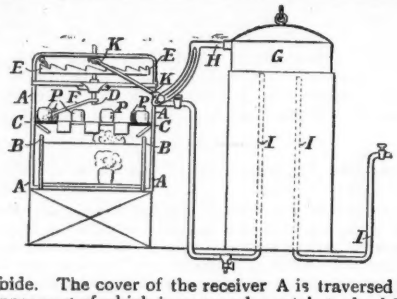
In order to prevent water supplied from the cistern C through the pipe E being carried over with the gas, apparatus F (of any suitable construction, and capable of arresting the water) can be arranged on the top of the holder. This apparatus consists of a series of blades, arranged to form a serpentine path for the gas, and on which the water vapour will be condensed before its exit through the pipe D.

In order to precisely regulate the automatic production of acetylene, it is convenient to reduce as much as possible the quantity of calcium to be acted on by the water; for the lime produced becomes hydrated at once, and provides sufficient humidity to produce gas without the addition of water. With a view to obviate this inconvenience, the acteylene generator is divided into a number of compartments, which communicate one with another only by small openings in the upper part of the partitions. The water thus enters only one compartment, and does not pass to the next until it has exhausted the carburet in the first. Consequently, if the carburet is distributed as equally as possible in all the compartments, the production of one compartment may be limited, at will, in limiting its charge, and in reducing or augmenting its capacity, without modifying, however, the total capacity of the generator. In a word, it is possible, without danger, to employ generators containing large charges of carburet, provided that the dimensions of the compartment and its charge be proportioned to the capacity of the holder.

Production of Acetylene Gas.—Hadden, R.; a communication from A. Boter, of Barcelona. No. 16,345; July 23, 1896.

This invention relates to apparatus for producing acetylene gas by the reaction of water upon calcium carbide in such a manner that the quantity of carbide brought into the water is previously measured for producing in an intermittent manner determined quantities of the gas as wanted for use.

The apparatus, as shown, is composed of a gas-generator, formed by a receiver A, which encloses another receiver B, for the water necessary for the production of the gas. At C (in the interior of the apparatus, and above the receiver B) is arranged a support, formed by horizontal and inclined boards in such a manner that there is alternately a horizontal and an inclined board. Upon each of the horizontal boards is placed a parcel P, which encloses a determined quantity of

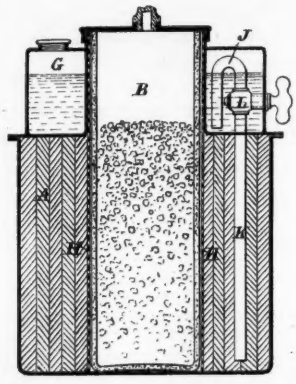


calcium carbide. The cover of the receiver A is traversed by an axle D, on the upper part of which is arranged a ratchet-wheel E. On the upper part of the axle, and in the interior of the apparatus, is fixed a rotary arm or rod F. G is the bell of the gasholder for the gas produced. This bell carries an arm H, part of which is bent and provided with a slit, in which is engaged the gudgeon K of a rotatory lever, which forms the pawl of the wheel E. The generator communicates with the gasholder by the pipe I; and the gasholder is connected with the supply-pipe by the pipe I^1.

The operation of the apparatus is as follows: On each of the horizontal boards in it is placed a parcel P, which contains a determined quantity of calcium carbide, and in the interior of the receiver B is put a determined quantity of carbide. The production of acetylene gas begins and passes through the pipe I and fills the holder G, in order to be carried away through the pipe I^1. When the gas being used allows the bell of the holder to sink, the slide H operates the gudgeon K and turns the wheel E, and the rod F pushes one of the parcels P upon the next inclined board, whence it falls into the water contained in the receiver. This produces a fresh quantity of acetylene gas, which lifts the bell G. The arm H then operates the gudgeon K in the contrary direction—moving the lever over the next tooth of the wheel E, which is held from revolving backwards by the pawl O. When the bell G again sinks to a certain limit, another parcel of calcium falls, and thus successively until the wheel E has made a complete revolution.

Producing Acetylene Gas.—Boult, A. J.; a communication from F. Alexandre, of Paris. No. 16,728; July 28, 1896.

The essential feature of this process for the production of acetylene gas lies in the fact that, instead of acting on the carbide of calcium by directly immersing or saturating it in the liquid intended to decompose it, this decomposition is performed by means of moisture or damp—*i.e.*, the carbide of calcium is submitted to the action of the moisture produced by aqueous vapours escaping from the liquid intended to decompose it, and not, as is usually the case, by the direct action of it in a liquid state.



The apparatus consists of a receiver A, in the interior of which is another receiver B—smaller but higher—for the carbide of calcium. It is made of porous material, and is closed at the top by a hermetical cap. This cover would have in its centre a tap serving for the liberation of the gas, and terminating in a burner. An annular cover, having in its centre a passage for the receiver B, closes the upper part of A, and supports a reservoir G, also annular and provided with an opening for filling. It is closed by a stopper, and contains in its interior a syphon J, ending in a tube K extending inside, and terminating slightly above the bottom of A. The syphon is provided, on the branch prolonged by the tube K, with a cock L, operated from the outside of G by means of a key or handle. The annular space of the receiver A is filled with spongy material, to absorb the liquid supplied by means of the syphon J and tube K in desired quantities, by means of the cock L, into the receiver A, for the purpose of producing aqueous vapours, which, according to the principle of this invention, should act with sufficient intensity upon the carbide of calcium to produce the decomposition of the latter, and consequently the evolution of acetylene gas. A sheath H of wire gauze or perforated metal keeps the absorbent material in position in the receiver A.

APPLICATIONS FOR LETTERS PATENT.

23,138.—Lones, A. E., "Gas-engine convertible into an oil-engine or *vice versâ*." Oct. 19.

23,140.—Mycock, S., and Carter, F. C., "Valves for controlling the flow of fluids." Oct. 19.

23,142.—Petavel, J. W., "Revolving cylinder oil or gas engine." Oct. 19.

23,147.—Mackenzie, W. J., "Apparatus for generating acetylene gas." Oct. 19.

23,182.—Middleton, W. H., "Explosion engines." Oct. 19.

23,245.—Pattison, J., "Improved ammoniacal compounds." Oct. 20.

23,250.—Bellamy, C. R., "Incandescent gas-burners." Oct. 20.

23,257.—Preston, J. E., and Simkin, C., "Gas, oil, or other vapour engine." Oct. 20.

23,289.—Becherel, C. F. J. B., "Apparatus for the manufacture of acetylene gas." Oct. 20.

23,290.—Becherel, C. F. J. B., "Apparatus for the manufacture of acetylene gas." Oct. 20.

23,352.—Lancaster, E. W., "Electric sparking apparatus for ignition purposes in oil and gas motors, and the like." Oct. 21.

23,381.—Rickard, J. R., "Gas or oil engines." Oct. 21.

23,454.—Bartlett, F. G., "Burners for incandescent gas lighting." Oct. 22.

23,457.—Hollings, L. S., "The Hollings double-acting gas-engine." Oct. 22.

23,483.—Grundy, F. B., and Moeller, J., "Improvements in the manufacture of appliances for effecting self lighting of gas." Oct. 22.

23,492.—Monin, H. F., and Perot, G. G., "Gas and petroleum motors." Oct. 22.

23,538.—Smith, R. H., "Combined gas and steam generator and engine." Oct. 23.

23,591.—Trouve, G., "Apparatus for producing and storing acetylene gas." Oct. 23.

23,592.—Trouve, G., "An acetylene lamp." Oct. 23.

23,595.—Theisen, E., "Improvements in purifying gases or vapours and gaining bye products therefrom, and in subjecting gases or vapours to the action of solid or liquid substances and the converse by means of centrifugal action, and apparatus therefor." Oct. 23.

23,600.—Simpkins, E., "Coin-freed gas-meters." Oct. 23.

23,616.—Cowan, T. W., "Gas-lamps." Oct. 23.

23,645.—Bradbury, J., and Harris, C., "Apparatus for utilizing the fluctuations of pressure in steam, gas, and other pipes." Oct. 24.

23,669.—Oving, H. E., "Production and treatment of acetylene gas." Oct. 24.

23,670.—Oving, H. E., "Treatment of acetylene or other gas for lighting, heating, or other purposes." Oct. 24.

23,701.—Lane, H., and Thomson, B. T. L., "Production of gas from petroleum and heavy oils for lighting and heating purposes, and apparatus therefor." Oct. 24.

23,702.—Nechutings, J., "Gas-pipe cutter." Oct. 24.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Wednesday, Oct. 28.

(*Before Mr. Justice* ROMER.)

Douglass v. Pintsch's Patent Lighting Company, Limited.

This was an action brought by the plaintiff, Mr. William Tregarthen Douglass, to restrain the defendants from threatening legal proceedings against persons who bought gas-buoy lanterns from him.

Mr. MOULTON, Q.C., and Mr. A. J. WALTER appeared for the plaintiff; Mr. R. NEVILLE, Q.C., and Mr. KIRBY represented the defendants.

Mr. MOULTON, in opening the case, said the plaintiff was Consulting Engineer to the Trinity House. In the month of September, 1895, he had an interview with Captain Jackson, the Harbour Master at Fleetwood for the Lancashire and Yorkshire and London and North-Western Joint Railways, and arranged to supply a certain number of gas-buoy lanterns in connection with the line between Fleetwood and Ireland, at a specified price. The defendant Company was formed many years ago to construct one form of these buoys; and they were very well known as the holders of patents, some of which, however, expired in 1890. The defendants were anxious to get contracts for the Fleetwood buoys, and also for similar ones for Belfast. Hearing from Captain Jackson, on Nov. 22, 1895, that the order had been given to the plaintiff, Mr. Rickmann, the Managing-Director of the defendant Company, wrote to him a letter in which this passage occurred: "I am afraid this matter will lead to difficulty. You must not be surprised if this Company applies for an injunction against Mr. Douglass to restrain him from selling the gas-buoy lanterns." The meaning of this was that the defendants were going to apply for an injunction against the plaintiff to restrain him from selling his lanterns; and he (Mr. Moulton) submitted that this was a suggestion that the plaintiff had infringed patent rights held by the defendants, and that therefore the plaintiff was entitled to the relief claimed. A similar letter was written to Mr. Porter, the Company's agent at Belfast; and it was shown to intending purchasers. The suggestion of the defendants was that, in his capacity of Consulting Engineer to the Trinity House, the plaintiff had access to drawings and documents furnished by the defendant Company of gas-buoys supplied by them to the Trinity House, and that he had from these been able to fulfil Captain Jackson's order. It was not, however, the fact that plaintiff had access to such documents, nor had he been consulted by the Trinity House in regard to gas-buoy lanterns. The defendants' patent under which they supplied buoys to the Trinity House expired in 1890; and accordingly there was no question of infringing patent rights, though this was implied in the threats complained of, and in respect of which these proceedings were taken.

Plaintiff was then called, and stated that, during the period of his engagement with the Trinity House, he was never consulted on the subject of gas-buoys. He had never seen drawings supplied by Pintsch's Company to the Trinity House, as he was not entitled to inspect any without special application. The action by the defendants was standing in the way of his supplying certain firms with gas-buoy lanterns.

In cross-examination, witness said he saw the Pintsch Company's lanterns in the Trinity House, and was aware that their 1876 patent had expired. The lanterns he contracted to supply were made in conformity with this 1876 patent, except with respect to certain parts. This was the first order he ever had for gas-buoy lanterns.

Mr. MOULTON put in the correspondence, and said this was the plaintiff's case.

Mr. NEVILLE, on behalf of the defendants, submitted that the letter, properly construed, did not involve a threat. He should call Mr. Rickmann and the gentleman with whom he consulted; and his Lordship would hear what was in their minds. The question was whether the defendants were acting *bonâ fide*, not as patentees, but as persons who conceived themselves to have a legal right against Mr. Douglass, owing to his confidential relation with the Trinity House.

Mr. *E. K. Blyth* the Company's Solicitor, having given evidence,

Mr. *Rickmann* said the Pintsch Company were under contract to deliver to the Trinity House gas-buoy lanterns when called upon to do so. Sir James Douglass was Chief Engineer at the Trinity House; and he had seen the plaintiff there frequently, but did not know in what capacity he was employed. His ground for suggesting that an injunction should be applied for was that it seemed to him there must be a remedy against Mr. Douglass, an officer receiving a salary from the Board of Trade, entering into competition with the defendant Company in the sale of gas-buoy lanterns; the Trinity House itself being precluded by agreement from such sale.

Cross-examined: The defendant Company had four patents still running. He based a statement in his affidavit, to the effect that the plaintiff had access to the defendants' drawings, and could make himself minutely acquainted with their details, on his having seen him at Trinity House when the gas-buoy lanterns were being examined.

Counsel for the defendants having addressed the Court,

Justice ROMER gave judgment without calling for a reply. He said the conclusion he had come to was that the plaintiff was entitled to relief. In his opinion, Mr. Rickmann did intend, in writing the letter, to lead the person who received it to believe that the Company were claiming to be patentees of the gas-buoy lanterns which the plaintiff was going to sell; and he thought this letter was intended to have the effect, if possible, of stopping the proposed sale, or, at any rate, of hampering it. He granted the injunction asked for, and ordered the defendants to pay the costs.

Friday, Oct. 30.

(*Before Mr. Justice* NORTH.)

Jorderson v. Sutton, Southcoates, and Drypool Gas Company.

This was a motion to restrain the defendant Company from constructing a large gasholder on land adjoining the property of the plaintiff, and from so moving soil as to endanger the stability o his house.

Mr. SWINFEN EADY, Q.C., in support of the motion, said the matter had been before the Vacation Judge, when the defendants had filed an affidavit in which they declared that their excavations had been carried to their full depth, and would go no farther; and they gave an undertaking to this effect. He suggested that the defendants should continue that undertaking until the trial of the action.

Mr. VERNON SMITH, Q.C., for the defendants, said he could not do this. The work complained of was being performed by contractors under heavy penalties; and by continuing the undertaking, the Company might be prejudicing them. Since the motion was first made, the plaintiff had not filed any evidence.

Mr. SWINFEN EADY said the reason his client had not done so was because he relied on the undertaking of the defendants. The plaintiff was quite prepared to go on with the motion; and if it stood over until next Friday, he would bring down the contractor. He therefore asked for liberty to amend his notice of motion by adding the contractor as a defendant, and to ask for an injunction to restrain damage to the light of plaintiff's premises.

Justice NORTH gave the required leave; and the motion stood over for a week.

COUNTY OF LONDON ASSESSMENT SESSIONS.

Sessions House, Clerkenwell, E.C.—Thursday, Oct. 29.

(*Before Mr.* M'CONNELL, *Chairman, Mr.* LOVELAND-LOVELAND, *Deputy-Chairman, and a Bench of Magistrates.*)

The Assessment of the South Metropolitan Gas-Works.

Sir EDWARD CLARKE, Q.C., M.P., Mr. BALFOUR BROWNE, Q.C., and Mr. W. C. RYDE represented the Company; Mr. LITTLER, Q.C., C.B., Mr. MARSHALL, Q.C., and Mr. HORACE AVORY appeared for the parish of Greenwich; Mr. MARSHALL, Q.C., and Mr. GRAHAM, for Battersea; Mr. MARSHALL, Q.C., Mr SINCLAIR COX, and Mr. CUTTER, for Woolwich; Mr. LAWSON WALTON, Q.C., and Mr. T. T. PAYNE, for Lewisham; Mr. GRAHAM and Mr. ELLIOTT, for Clapham and Streatham.

Sir E. CLARKE, in opening the case, said the undertaking affected 24 parishes; but the appeals before the Court only related to 13, the others having been arranged with. Among those parishes which had come to terms with the Company were Lambeth, Camberwell, St. Olave's, and St. Saviour's, which were the most important parishes for the purpose of the undertaking, and the largest in rateable value. He was not without hope that before the case went very far, the representatives of the 13 parishes before the Court might see their way to accept the basis which had been agreed to by the other parishes. During the latter part of 1895, the Chairman of the Company went before the Assessment Committees; and the result was a substantial reduction in most cases from the Overseers' figures. But still the figure then fixed was, in almost every case, very seriously higher than that which the Company would submit was the proper one. In the parish of Battersea, for instance, which was the first upon the list, the rateable value of the Company was agreed to, as from the year 1890 to 1895, at £2342; but the Assessment Committee now raised it to £5850. There were three matters to be considered in the case of a gas undertaking: First, the rateable value of the stations and the properties held in different parts of the district; second, the value of the unproductive mains; and third, the value of the directly productive or rent-earning mains. The figures had been agreed with regard to the first two items, except as to some small question which might be raised on the distribution (as between the parishes) of the value of the unproductive mains. The figures which the Company would put before the Court would be based on those for the year ending June 30, 1895; and these figures had been before the Assessment Committees. But, of course, the figures for a particular year could not of themselves determine the rateable value of the undertaking for five years; and therefore Mr. Livesey had pointed out to the Assessment Committees certain very important considerations affecting the future value of the property. The year 1894 was one of exceptional prosperity, owing to the cheapness of coal and the high prices obtained for residuals; but in the autumn of 1895, when Mr. Livesey was before the Committees, these circumstances had changed. Therefore the figures shown by the accounts for the year ending June 30, 1895, could not be accepted as a correct representation of the Company's position.

Mr. *Arthur L. Ryde*, in reply to Mr. BALFOUR BROWNE, said he had valued the works of the Company. He had taken the year ending June 30, 1895, because that was the latest year available to the Assessment Committees when hearing the appeals. It would be most unfair to base the rateable value on an exceptional year like 1894. It was perfectly well known to everybody connected with gas companies that that was one of the very best years they had ever had, and that it was not likely to recur. No tenant would be foolish enough to give a rent based on the 1894 figures, when he knew what had taken place in the early part of 1895. The receipts from the sale of gas to private consumers for the twelve months ending June 30, 1895, were £809,665, from which he deducted £28,916 in consequence of a reduction of 1d. per 1000 cubic feet in the price of gas, which had been made at Midsummer, 1895. This left £780,749. The sale of gas for public lamps produced £61,045, which made the total gas-rental £841,794; and to this he added £36,418, the rental of meters and gas-stoves. He then deducted £3088 for bad debts; thus bringing out £875,124 as the total amount of gross receipts. Turning to the working expenses, he found that the coals for the year cost £426,482, from which he deducted £19,646—that was 6d. per ton on 785,844 tons carbonized—to allow for the reduction in the coal cost of the following year. This gave £406,836 as the cost of the coals, to which he added £21,308 the cost of the purifying materials—making £428,144. From this he deducted £291,575 the receipts from residual products, made up as

follows: Coke, £191,970; breeze, £5897; tar, £49,975; ammoniacal liquor, £26,609; and sulphate of ammonia, £17,124. This left £136,569 as the net cost of coals and purifying materials. To this figure he added salaries, wages, repairs to meters and stoves, workmen's sick and superannuation fund, the cost of profit-sharing, and other items, amounting to £232,836. Then came the repairs and maintenance of works, plant, mains, and service-pipes. These amounted to £172,430 for the year, one-third of which—£57,477—he allotted to the tenant as his share. These three items of £136,569, £232,836, and £57,477, together with £49,562 for rates and taxes, at 6s. 5d. in the pound, produced a total for working expenses, *plus* rates, of £476,444, which deducted from the £875,124 gross receipts previously arrived at, left £398,680 as the net receipts which had to be divided between landlord and tenant. He considered that the tenant's capital ought to be £700,000. The tenant ought to be allowed five average months' working expenses. The coal and purifying materials for a year would come to £428,144, from which he deducted four-fifths of the receipts from residuals (£233,260), leaving £194,884. He made this deduction to allow for the one month's credit which was usually given. To the £194,884, he added salaries, wages, repairs to meters and stoves, and other items, which brought out a total of £524,107, five-twelfths of which produced £218,378. Then the tenant would have to take over from the previous tenant the meters and gas-stoves in use, the total value of which, less 20 per cent. for depreciation, he estimated at £321,818. The tenant would also require to have in hand six average weeks' stock of coal and purifying materials, which he put at £51,636; and stores (including tools, materials, meters, and stoves in stock), which he put at £105,641, two-thirds of which, or £70,426, he allotted to the tenant. The cash at the bank should be £15,000; and there should be an allowance of £41,391 for the automatic gas-fittings. The latter figure he arrived at by taking the number of fittings (32,333) in use in the year ending June 30, 1895, at 32s. each, less 20 per cent. for depreciation. This brought up the tenant's capital to £718,649, from which should be deducted £17,314, which was two-thirds of the total amount of the deposits by new customers. This left as the tenant's capital a sum of £701,335, which, for the purpose of his valuation, he had taken at £700,000. He had allowed for two-thirds of the deposits, instead of the whole amount, because of the liability the Company were always under of being called upon to pay them back. The usual 17½ per cent. on £700,000 came to £122,500. This, deducted from the net receipts (£398,680), left £276,180, from which the statutable deductions had to be made. These latter for works, machines, and retorts, were £141,769; and for mains and service-pipes, £30,661. This, less the sum of £57,477 already charged under the head of working expenses, and *plus* £1400 for insurance and £5346 for renewals of gasholders, made £121,699, which sum, deducted from the £276,180, brought out £154,481 as the total rateable value of the whole concern. The rateable value of the works was, so far as he knew, absolutely agreed upon; and it was as follows: Old Kent Road, £15,000; East Greenwich, £23,000; Old Greenwich, £5100; Roan Street, Greenwich, £1360; Vauxhall, £10,400; Kennington Lane, £6843; Bankside, £18,000; Rotherhithe, £7000; Black Horse Bridge, Deptford, £400; and Creek Street, Deptford, £275 This made a total of £71,178, to which he added £3750 as the estimated rateable value of mains treated as unproductive. Deducting the figure thus arrived at—£74,928—from the rateable value of the whole concern, he obtained as the rateable value of the productive mains £79,553, or 8·918 per cent. on the gross receipts, less the lighting and cleaning of public lamps. The gross receipts were £892,070; and the Company were not appealing in the parishes which produced £525,416 of this amount.

Cross-examined by Mr. LITTLER: The landlord's capital would be about two and a half millions. He had no doubt that, as put by the learned Counsel, between 1889 and 1894 the total amount of gas sold had increased from 5,648,601,000 cubic feet to 6,994,465,000 cubic feet, or 23·8 per cent.; and that between 1880 and 1894, the increase had been 3,448,330,000 cubic feet on an original quantity of 3,546,132,000 cubic feet, or nearly double. His firm had put the rateable value of the undertaking in 1880 at £98,350, as against £154,481 now. The present valuation included new works in East Greenwich, the rateable value of which was agreed at £23,000. The amount of gas sold was not the only factor in these matters—the price, for instance, was one thing which must not be overlooked. Therefore it must not be assumed that, because the consumption had doubled, the rateable value ought to be doubled too. The tenant's share was put in 1880 at £65,621; and in 1894-5, at £122,500. The dividends were then 11 per cent.; and in 1894 they were 13 per cent. He would take it from the learned Counsel that coal in 1879 was 13s. 10d. per ton, as against 10s. 6d. in 1894; that wages were 3s. 1½d. per ton, as against 2s. 7½d.; and that the net cost per ton of coal was 8s. 2½d., as against 5s. 6½d. He was in favour of the usual 17½ per cent.; but it should be taken as one figure, and not divided up into 5, 10, and 2½ per cent. He thought the 5 per cent. interest on tenant's capital might be justified; but certainly the 2½ per cent. for risks and casualties was now too little—it ought to be 5 per cent.

By Mr. GRAHAM: At the end of the five months, the receipts would be coming in so fast that the tenant would not require to draw on his own resources any more.

By Mr. LAWSON WALTON: Earlier than 1881, 20 per cent. was allowed. Then it became 17½ per cent.; and he admitted that there was no finality in that figure. The time had not, however, yet arrived to change it. The subdivision could be altered; but the 17½ per cent. as a total was still correct.

By Mr. MARSHALL: He considered that profit-sharing and the contributions to the workmen's sick and superannuation fund were wages in another form.

By Mr. LITTLER: If the sum under the head of profit-sharing was not paid until the profits for each half year were ascertained, then it was wrong to include it.

The cross-examination of Mr. Ryde upon the details of his valuation, and his re-examination by Sir Edward Clarke, were, by arrangement, postponed.

Mr. *George Livesey*, Chairman of the Company, in reply to Sir E. CLARKE, said that in the autumn of 1895, he attended the Assessment Committees at a time when the accounts up to June, 1895, had been published, and when they knew of the lower price of residuals. The year 1894 was the most prosperous he had ever known; and they made a larger profit then than they had made before or since. The price of ammonia was higher than it had been for many years, and double what it was now. Sulphate of ammonia averaged £12 18s. 5d. per ton; but this year it would not average more than £7 10s. 0d. Coke was sold by contract to the cement makers in September, 1893, at 11s. 8d. per ton; but in the contracts made in September, 1894, the prices ranged from 12s. 6d. to 13s. 4d.—the average being 12s. 9d. Now their contracts had just been made at 8s. 6d. per ton. In 1895, as he had pointed out to the Assessment Committees, the contracts were fixed at 10s. per ton, or a reduction of 20 per cent. on the 1894 prices. About three-fourths of the coke was sold locally; and whereas the price for it in 1894 was 8d. per cwt., in 1895 it had come down to 6d. In June, 1895, as the Committees were informed, the Company reduced the price of gas by 1d. Every 1d. reduction which they made gave the consumers about £30,000 a year; but under the sliding-scale, it only entitled the shareholders to an extra £5200, or thereabouts. In order to recover this £30,000, they must sell gas to three and a half times that value—that was, they must increase their revenue by £105,000. The great strike cost the Company £62,000; but this sum was excluded from the settlement of 1890, on the ground that it was one of the contingencies covered by the 2½ per cent. allowed for risks and casualties. This did not, however, represent the entire loss of the Company, for they lost business in consequence of being unable to supply all the gas their consumers wanted; and the cost of labour was increased, owing to the new men not being so expert as the old. He calculated therefore that, in addition to the £62,000, there was another £40,000 lost by the Company because of the strike. In three years they took from their reserve fund something like £326,000—including the cost of the strike. In the years 1889, 1890, and 1891, there were deficiencies which practically exhausted their reserves. In 1892, they turned the corner, and made a profit which was increased in 1893. If all their losses had been distributed over the quinquennium, they would come to £65,000 a year, or over 9¼ per cent. upon the tenant's capital of £700,000, instead of the 2½ per cent. allowed in Mr. Ryde's valuation. In the quinquennium, there had been a coal strike in Durham—from which county they obtained all their coal—lasting for three months; and two severe frosts, which had added to the difficulty and expense of getting the coal to their works. He agreed that the tenant should have five average months' working expenses, though that would not be equal to the four winter months, when the working expenses were greatest. Each collector had a thousand automatic meters to collect from; and it took him a month or five weeks to go round. The system of profit-sharing was established in 1889, with the object of attaching the workmen to the Company. It was a plan whereby a bonus was paid to all employees of the Company; the bonus being regulated by the price of gas. It was, in fact, an extension of the sliding-scale to the employees. They fixed 2s. 8d. per 1000 feet as the standard price of gas for this purpose; and for every 1d. below this price at which gas was sold, 1 per cent. was added to the salaries and wages. It began with 5 per cent., and in June, 1895, it was 6 per cent. It was paid yearly on July 1; but an estimate was made in December of what half of it would be, and this half was charged to the December account. It was a kind of deferred pay. Comparing 1889 with 1894, the gas sold had increased in the period by 23 8 per cent., the capital by 19 per cent., and the dividend and interest paid by 8¾ per cent. The parishes against whom the Company were appealing claimed, even on the figures as reduced by the Assessment Committees, very large increases of rateable value. Battersea claimed an increase of 149 per cent.; Plumstead, 164 per cent.; and Lewisham, 147 per cent. Others of the parishes made lower claims—Greenwich asking for 88 per cent.; Woolwich, 61 per cent.; and St. Nicholas, Deptford, 38 per cent. The discrepancies shown in these figures were, of course, partly explained by the difference in the rate of increase of business in the various parishes. In the parishes with which they had settled, the increase averaged some 40 per cent.

By the CHAIRMAN: Some of their coals were actually paid for before delivery; and, in any event, they were always paid for within a week after delivery. As to residuals, the retail trade was a cash trade; but for ammonia, the Company gave a month's credit. Their bargains with the colliery owners were always understood to be for cash, and had been so since he had had anything to do with the Company.

Cross-examined by Mr. LITTLER: Their coals during the last twenty years had, one way and another, cost them 1s. 6d. per ton less than was the case with The Gaslight and Coke Company. Wages were not reduced in consequence of giving the men the bonus. The Company obtained this advantage from the system—that they were secured against a strike on the part of their own men, and they got more cheerful and more willing work. The best evidence he could give of the latter was to compare the cost of their carbonizing with that of other companies paying the same wages. It cost the South Metropolitan Company some pence per ton less, because their men worked better. If he were a tenant from year to year, he would unquestionably pay this bonus.

By Mr. MARSHALL: There was no doubt the bonus and the sick and superannuation funds were really taken into account by the men when considering their wages. The sick fund was started in 1842; and the superannuation fund in 1855. For stokers they paid the same wages as other companies; but they got better work. For other trades, they had declined to pay the wages dictated by the Trade Unions; and they found that men were very glad indeed to come to their service at less wages, considering all the other advantages offered by the Company. The average amount of the consumers' deposits did not vary very much. He saw no reason why the automatic meters and stoves should not last as long as the others—namely, five years in the case of the stoves and seven years in that of the meters.

The proceedings were then adjourned till Saturday.

Saturday, Oct. 31.

On our representative attending at the Sessions House to-day, he was informed that the case had been postponed *sine die*. We learn

that the only available days for rating appeals in the present year have been already arranged for by other parties. Consequently, if that of the South Metropolitan Company is not settled out of Court, it may not come on again till 1897.

The Ystrad Gas Company Fined for Refusing to Supply Gas.

At the Pontypridd Police Court last Friday week, the Ystrad Gas and Water Company was summoned by Mr. Rees Bevan, a jeweller, of Porth, for refusing to supply him with gas. Mr. Latham represented the complainant; and Mr. G. M. Evans, the defendants. Mr. Latham explained that his client was refused a supply of gas from Oct. 9, although, on the 9th and 10th, he offered to deposit £3 on each occasion. The Manager had for some inexplicable reason absolutely declined to supply the gas; and the Company were liable to a penalty of 40s. for each day they refused. Mr. Evans pleaded guilty on behalf of the Company, but explained the reasons which led to the refusal of a supply. The Bench thought the applicant had been badly treated, and imposed a fine of £3, with costs.

The Maidstone Corporation and the Water-Works.—The Maidstone Town Council having decided to purchase the undertaking of the Maidstone Water Company, a statutory meeting of the Council has been held to sanction the promotion of a Bill next session to obtain the necessary authority. The resolution submitted had only one opponent—Mr. Lawrence—who wished to have the question referred to a Special Committee; but when it was put he abstained from voting.

The Malvern Link District Council and the Gas-Works.—A special meeting of the Malvern Link District Council was held last Tuesday, to consider the proposal to acquire the works of the Malvern Link Gas Company. Colonel Ottley, who presided, said the Company had agreed to sell their undertaking, the paid-up capital of which was £12,000, upon terms to be settled by arbitration; and he thought it would be to the interests of the ratepayers to secure the works, which had hitherto paid 7 per cent. The Council would probably be able to effect economy in manufacture; and the profits would yield a good sum yearly in aid of the rates. The Company had in contemplation an application to Parliament for statutory powers; and if these were obtained, the value of the works would be greatly increased. A resolution in favour of the purchase was carried; and, if the ratepayers agree, a Bill will be promoted in the ensuing session.

The Newcastle Gas Company and Automatic Prepayment Meters.—At the meeting of the Gateshead Town Council last Wednesday, the Town Improvement Committee reported that, as the result of negotiations with the Newcastle and Gateshead Gas Company, they had received an intimation from the Company that the Directors had fully considered the representations made by the deputation from the Council who waited upon them for the purpose of inducing them to adopt for small consumers of gas automatic prepayment meters. The Directors, while appreciating the motives of the deputation, were of opinion that the very large use at present of the ordinary 3-light meter very much lessened the necessity for adopting the penny-in-the-slot system. The Directors, however, would bear in mind the representations of the deputation, and would do all in their power to meet their views when increased production from the new works placed the means in their hands.

The Reigate Corporation and the East Surrey Water Company.—At the meeting of the Reigate Town Council last Monday, Mr. Viall proposed—"That a Bill be promoted in the next session of Parliament with the object (among others) of altering, varying, and reducing the rates and charges which the East Surrey Water Company may now charge for the supply of water within the borough, and of amending the Acts relating to the Company with reference to that supply." He said every member of the Council, and almost every resident in the borough, was aware that the charges paid hitherto to the Company were exorbitant to a degree; and it was the duty of the Council to take steps to get this state of things altered. Alderman Brown pointed out that the Council had not approached the Company to inform them what was wanted. Mr. Kenrick seconded the motion. He urged that they should proceed to promote a Bill, because this would make them right whatever happened; but, from what he had heard, the Directors of the Company were willing to meet the Council. Mr. Barnes moved as an addendum to the resolution: "That the same be withdrawn, provided an amicable arrangement be come to between the Company and the Corporation." Mr. Brackley seconded the proposition. The addendum was, however, withdrawn, and the resolution carried.

The Proposed Supply of Thirlmere Water to Wigan.—At a special meeting of the Wigan Town Council last Wednesday, the minutes presented by the Joint Parliamentary and Water Committee contained the following statements in regard to the proposed supply of water from the Thirlmere aqueduct (see *ante*, p. 756): "The Town Clerk reported that the deputation appointed by the Parliamentary Committee had had an interview with the Parliamentary Agents, and, after communicating with the Local Government Board, and satisfying them that our limits of supply were confined to the borough, the Board consented to entertain the application for a Provisional Order, which would enable the Corporation to compulsorily acquire the necessary easements and rights in connection with the proposed pipe-line, and also to authorize the borrowing of the money required to carry out the scheme. The deputation recommend this course to be followed. It was resolved that the action of the deputation and their recommendation be approved and adopted; and that the Town Council be recommended to order an application to be made to the Local Government Board. The Town Clerk also reported that while in London he had seen the Town Clerk of Manchester on the matter, and had ascertained from him that, so far as he could see, there would be no objection to a provisional agreement being entered into at once between the two Corporations for the proposed water supply. A draft of the proposed agreement was read; and it was resolved that the Town Clerk be instructed to inform the Local Government Board of the terms of the agreement, and to ask for their approval thereof." The minutes were confirmed.

MISCELLANEOUS NEWS.

THE LIVERPOOL CORPORATION AND THE GAS COMPANY.

At the Meeting of the Liverpool City Council yesterday week, only a few minutes were occupied in the consideration of the report of the Special Sub-Committee of the Lighting Committee upon the "observations" of the Directors of the Gas Company on a previous report dealing with the gas supply and the system of working. A resolution confirming the report of the Sub-Committee (see last week's issue, p. 797) was moved by Mr. Banner. Thereupon, Alderman F. Smith expressed the opinion that the Committee were giving a most feeble rejoinder to the Gas Company; and he twitted Sir Arthur Forwood with not having been able to get from Mr. Edward Lawrence any more information than the previous Lighting Committee. Sir Arthur Forwood said the Gas Company had answered certain questions as to the coal used in the production of gas; and the Committee now wished to obtain some information as to their mode of manufacture. They believed that "several" of the works were obsolete, and contained old-fashioned machinery, which produced gas at a greater cost than more modern apparatus; and they desired to have further information on this point. Mr. J. Lister remarked that the communication from the Corporation would be before the Directors of the Company on the following Wednesday, and would receive from them most earnest and courteous treatment. The proceedings of the Committee were confirmed.

REMARKABLE OCCURRENCE AT STALYBRIDGE.

Unpurified Gas Sent Out.

An extraordinary accident—unprecedented in the history of gas making—happened in Stalybridge last week. On Tuesday night and Wednesday, the air was strongly impregnated with sulphur. In several of the large mills, the fumes had a stupefying effect on the work-people, some of whom had to be carried into the open air; and industrial operations had, for the time being, to be stopped. Eventually it was ascertained that an accident had occurred at the gas-works, in consequence of which gas had been supplied throughout the town in an unpurified state for a period of 14 or 15 hours.

In answer to questions put by our Stalybridge Correspondent, Mr. W. Carr, the Gas Engineer and Manager to the Corporation, stated that he discovered what was amiss immediately on his arrival at the works on Wednesday morning. Continuing, he said: "During last January, it was found that with all our retorts at work we could not make sufficient gas to keep the town going; so the Gas Committee of the Corporation determined to put in some retorts on a new principle which would enable us to make a larger quantity of gas with the same room, as we had no spare ground on which to build a new retort-house. In connection with these new retorts, I have introduced a fresh principle of hydraulic main, which enables me to get rid of the tar almost as soon as it is made. In order to do this, I have designed a main with a sloping bottom, about 18 inches deep at one end and 3 feet deep at the other. The top is perfectly level, and the water-level is the same as in an ordinary hydraulic main; but the bottom, as stated, dips to one end, so that the tar, when it condenses in the main and falls to the bottom, will gradually travel towards the deep end, at which point it is taken off into a stand-pipe. This pipe has an adjustable overflow to keep the water-line at the required level in the hydraulic main, and is also fitted at the foot with a sluice-valve which can be opened from time to time in order to draw off the tar that may be deposited there, and so keep the hydraulic main filled with water only. During the afternoon or evening of Tuesday, the water in one of these mains was, by some means or other, drawn off, leaving the dip-pipes unsealed, so that when the stokers came to draw the coke out of the retorts and recharge them, large quantities of air were drawn in at the ascension-pipes. This air not only reduced the illuminating power of the gas, but when it passed into the purifiers, which were filled with oxide of iron, it set up chemical action, causing revivification, which gave off a large amount of heat. The heat so produced set fire to the sulphur which is present in large quantities in oxide; and the air continuing to be drawn in through the unsealed pipes at the various times of charging during the night, supplied the necessary oxygen for combustion, producing sulphurous acid fumes; and these passed forward with the gas into the holder. Although there were several purifiers through which the sulphurous acid fumes had to pass after leaving those which were on fire, yet oxide has no affinity for these fumes; so they went into the holders, and thence into the street mains, and so caused the great discomfort and inconvenience which were experienced on Wednesday morning, and to some extent on Wednesday evening."

"What is the advantage of the principle you have designed and adopted over the old?" asked our representative.

"The hydraulic mains on the old principle often get blocked with pitch when working at the high temperature which we sometimes have to do with this new kind of retort-setting; whereas with the principle I have adopted this difficulty is obviated."

"Is the advantage of the new over the old commensurate with the additional risk with which it is apparently attended?"

"That is a matter for each authority to decide for itself. I put up two mains on the same principle at Halifax, and worked them for years without anything of the kind happening. All that is necessary is to see, in drawing off the tar, that the valve is not kept open sufficiently long to allow the water to escape. If water is so allowed to escape, then proper care ought to be taken to refill the main."

"What precautions do you propose to adopt to prevent a recurrence of the incident?"

"We shall have valve-locks, and only certain people will be allowed keys. The tar only needs drawing off once or twice a day, just as we find it accumulating."

GEORGETOWN (BRITISH GUIANA) GAS COMPANY, LIMITED.

The Half-Yearly General Meeting of this Company was held last Tuesday, at the London Offices, 30, Gracechurch Street, E.C.—Mr. CHARLES GANDON in the chair.

The SECRETARY (Mr. S. Wood, F.C.A.) read the notice calling the meeting; and the report and accounts, to which allusion was made last week, were then presented.

The CHAIRMAN, in moving their adoption, said he was sorry that the accounts were, if possible, even more unfavourable than those for the previous half year. The efforts of the Directors in effecting economies in Georgetown, and in endeavouring to promote the prosperity of the Company, had been attended with little or no success. Perhaps the most unsatisfactory point in the balance-sheet was that there had been a falling off in the gas and meter rental from private consumers. In December last, this item amounted to £1802; while in the present accounts it was £1533, or £269 less. The working expenses had decreased by £80; but this was due almost entirely to a smaller quantity of coal having been used. The price of coal had remained very nearly the same. In the previous half year it was £1 3s. 1d. per ton, and in the past half year £1 3s. 9d.; so that practically it was the same. He was afraid there was not much prospect of any material improvement in this direction for the present. The trade in the colony was bad indeed. Sugar was the main production of the place; and they were informed that numerous sugar estates had been closed, and those that were working were doing so at a loss. These reports were very discouraging. Regarding the prepayment gas consumers, there had been a fair improvement in the number during the half year. They had now secured 87 consumers, with a rental of £154. This was not sufficient to compensate for those ordinary consumers who had discontinued using gas, or who had not consumed so much. A great deal of this falling off was no doubt due to the inability to pay, or the poverty of the colony, on account of the state of the sugar market. On the occasion of the last meeting, he mentioned that, on the expiration of the Electric Lighting Company's contract for lighting the streets of the town, the Directors were hopeful of securing a portion of the public lighting for the future. The electric lighting contract expired on Dec. 31 next; and he was happy to say they had succeeded in obtaining a contract for lighting 114 of the public lamps from that date for five years. They had hoped to have had more; but for the present they must be contented with what they had been able to secure. On account of the decrease in the business of the Company, they had been working at considerable disadvantage in having a highly paid official at Georgetown (whose services were, perhaps, not needed for so small a business) in the person of their Manager, Mr. T. B. Younger. This gentleman fully recognized their position; and he made the Board certain proposals for his retirement, which they considered were very fair. These proposals had been accepted; and Mr. Younger returned to England in July last. As, however, he had an agreement with the Company which did not terminate until the end of next year, the full benefit of his retirement would not be felt until after that period. In the meantime, he had accepted a considerably reduced retiring allowance, and would give the Company his services at home as Consulting Engineer. At the end of his engagement, the Directors hoped that nearly the whole of the payment they had been making to him in the past would be saved. It was with much regret that the Board felt compelled to accept these conditions; and he was sure Mr. Younger equally regretted it, as, with the exception of a short interval, he had been connected with the Company since its formation. It appeared, however, to the Board to be imperatively necessary to take this step in order to economize. He (the Chairman) did not think the prospects of the Company would be prejudiced by Mr. Younger's retirement, as they had still in Georgetown a local Director (Mr. G. Russell Garnett) and the local Secretary (Mr. F. A. Conyers), both of whom had always evinced considerable interest in the welfare of the concern, and would, he was certain, do their best to promote its prosperity in the future. In the place of Mr. Younger, they had engaged Mr. D. F. Drayton as Manager of the works. This gentleman had been associated with the Company for many years, and was fully conversant with all the details of its working. Therefore, the shareholders might rest assured that the Company would not be at a loss on that account. He was afraid he could not say anything more that would be of any encouragement to the shareholders.

Mr. R. BERRIDGE seconded the motion, which was unanimously carried.

The CHAIRMAN proposed the declaration of a dividend on the preference share capital at the rate of 8 per cent. per annum, less income-tax, except on dividends payable to shareholders in Georgetown.

Mr. H. W. ANDREWS seconded the proposition, which was carried.

The CHAIRMAN next moved a vote of thanks to the Officers, Auditors, and Solicitor. He remarked that he was sure the shareholders would agree with the Directors that the officials had all done the best they could under very trying circumstances. He knew, from his own personal knowledge, that, if their efforts had not resulted in producing greater prosperity, the fault was not theirs; and, moreover, their duties were rendered more arduous while things had not been so prosperous as formerly.

Mr. ALFRED LASS, F.C.A., seconded the motion, which was unanimously carried.

The SECRETARY and the SOLICITOR (Mr. E. K. Blyth) having responded, the latter gentleman proposed a vote of thanks to the Chairman and Directors; assuring them at the same time of the sympathy of the shareholders during the present discouraging times.

Mr. H. J. HARTLEY seconded the motion, which was passed.

The CHAIRMAN acknowledged this expression of the confidence of the shareholders, and the proceedings then terminated.

Additional Purifying Plant for the Guildford Gas-Works.—Messrs. E. Cockey and Sons, Limited, have secured the contract to erect four new 30 feet square purifiers, and take down and re-erect the four existing boxes, at the Guildford Gas-Works.

CEARÁ GAS COMPANY, LIMITED.

The Annual General Meeting of this Company was held last Friday at the London Offices, 9, Queen Street Place, E.C.—Mr. HORATIO BROTHERS in the chair.

The SECRETARY (Mr. T. Guyatt) read the notice convening the meeting; and it was agreed to take as read the report and accounts, of which the main features were given last week (p. 799).

The CHAIRMAN, in addressing the shareholders, said the total expenditure on the manufacturing, trade, and other accounts for the year at Ceará was £2468 in excess of the previous twelve months. The principal items of this excess were £1515 more for coals, and £709 more for general charges. The cost of coal per ton delivered at Ceará was 3s. 2d. per ton higher than in 1895. The general charges had been increased by the travelling expenses of the Manager (Mr. T. M'Making) on his holiday to this country, and by the additional cost of all articles at Ceará, owing to the less purchasing power of the milrei. The make of gas per ton of coal carbonized had not been satisfactory, and was attributed by the Manager to the unusually inclement weather at the time of unloading or discharging the coal ships, as well as to the coal not being stored under cover. This, however, was now being rectified; and the Directors expected that by this time the coal-stores were covered in. The item of exchange was £601 in excess of that for last year—amounting this year to the large sum of £5354. From present appearances, it was not likely to be much less in the near future. He saw from "The Times" that the milrei was quoted at the value of $8\frac{1}{16}$d.; its nominal value being 27d. Last year, when he addressed the shareholders, it was quoted at $9\frac{15}{16}$d., or nearly 10d., which they then thought very low, and hoped for better times. This depreciation of the milre affected them in two ways: First, they obtained a less money value for every 1000 cubic feet of gas sold to the private consumers, who paid in currency the stipulated price per 1000 cubic feet; and, secondly, they had to pay on this account more in wages, and for everything purchased in Ceará. The increase in the sale of gas was very satisfactory, especially in the private consumption, as distinguished from that of the public lamps. There had, however, been a slight diminution in the latter. The total increase in the consumption represented £2119; and the private consumption was £2270 in excess of that for 1895—showing an advance of nearly 23 per cent. The products and fittings had also yielded a very satisfactory increase. Contractors' men were at work at Ceará erecting the new gasholder and tank, iron roof, purifiers, and other apparatus. The Directors confidently looked forward to these extensions and improvements justifying the expenditure by more efficiently and economically manufacturing and distributing the gas, and removing the complaints of the Manager and his staff as to their inability to give complete satisfaction to the consumers, as well as the dissatisfaction with which the Directors had viewed the position of things. When the new apparatus was completed, there would be no room for such complaints. The Directors hoped that the balance-sheet in 1897 would show a better return, and enable them to recommend a higher dividend. He concluded by moving the adoption of the report and accounts.

Mr. J. DARELL BLOUNT seconded the motion, which was unanimously carried.

On the proposition of the CHAIRMAN, seconded by Mr. BLOUNT, dividends at the rate of 5 per cent. on the preference shares and of 4 per cent. on the ordinary shares were declared for the half year.

The CHAIRMAN proposed the re-election of the retiring Director, Mr. A. J. King, who, he said, had been a member of the Board for the long period of seventeen years.

Mr. F. A. WALLROTH seconded the proposal, which was unanimously carried.

The Auditor (Mr. Magnus Ohren) having been re-appointed,

Mr. R. L. ANDREWS moved, and Mr. SKAIFE seconded, a vote of thanks to the Chairman and Directors for their careful attention to the affairs of the Company.

The services of the Secretary, Manager, and staff were also similarly acknowledged.

SALES OF SHARES AND STOCK.

At the Mart, Tokenhouse Yard, last Tuesday, Mr. Alfred Richards sold by auction shares and stock in several important gas and water companies. The first parcel submitted was 4 per cent. perpetual debenture stock of the Aldershot Gas and Water Company; and the bulk of it found purchasers at £120 and £121 per cent.—two £100 lots, however, fetching £126 each. Some £10 5 per cent. preference "E" shares sold for £13 10s. each; a few fetching 5s. more. A number of £10 "A" and "C" shares in the Eastbourne Gas Company, the last dividend on which was at the rate of 14 per cent. per annum, were knocked down at £35 and £36 each; the purchaser taking the dividend accruing from July 1 last. Some £25 fully-paid shares in the Hastings and St. Leonards Gas Company, bearing a 13 per cent. dividend, realized £80 and £82 apiece *cum div.*; £20 shares in the same Company, carrying 10 per cent. dividend, fetching £52 and £54 each. Consolidated "C" stock of the Harrogate Gas Company, the last dividend on which was at the rate of $13\frac{1}{2}$ per cent. per annum, but, in view of the present price of gas, might be $14\frac{1}{2}$ per cent., realized £337 10s. and £340 per £100 of stock—the latter price being obtained for the bulk. Some original ordinary consolidated stock of the Brighton and Hove Gas Company ($11\frac{1}{2}$ per cent.) sold at the rate of £305 per cent. *cum div.* "A" and "C" stock of the Barnet District Gas and Water Company (9 per cent.) fetched £250 and £253 per cent.; "D" stock selling at the rate of £181 per cent. Some £10 5 per cent. preference shares in the South-West Suburban Water Company changed hands at £11 15s. per share. A parcel of 4 per cent. perpetual debenture stock of the West Ham Gas Company sold for £128 per cent.; and some original fully-paid £5 shares ($9\frac{1}{2}$ per cent.), for £12 5s. each. Sixty £10 shares ($6\frac{1}{2}$ per cent.) sold for £16 10s. per share. Some 5 per cent. perpetual debenture stock of the Dorking Gas Company

was knocked down at the rate of £145 per cent.; £25 fully-paid "A" shares sold for £61 10s. each; and a few £25 "C" shares (7 per cent.), for £30 apiece. Eight original £10 fully-paid shares (10 per cent.) in the Sutton Gas Company were sold, with the dividend accruing from July 1 last, for £26 each; and four additional shares (7 per cent.) for £17 apiece.

On the following day, Mr. Bousfield (Messrs. Edwin Fox and Bousfield) offered for sale by auction an entire Adventurer's share in the New River Company. The share, which qualifies the holder or his nominee for a seat at the Board, returned last year a dividend of £2736 (exclusive of fees), with interest in the reversion to the Clerkenwell Estates of upwards of 50 acres covered with houses, the leases of which begin to fall in in 1903. In addition, the owner of the share is entitled to an interest in the other estates of the Company—apart from the water business—in London and the suburbs, and in the counties of Middlesex, Essex, and Herts, which confer the parliamentary franchise and other privileges requiring a landed qualification. The Auctioneer, who stated that the share was being sold to close a trust, mentioned that the revenue of the Company, derived from land and water, had advanced within the last 24 years from £283,000 to £570,000. There was a large attendance at the sale. The bidding started at £95,000 and ultimately reached £125,250, at which price it was knocked down to a private gentleman who desired to withhold his name from the public. This is believed to be the highest price ever given for one of these shares; a similar share being sold in 1889 to the Prudential Assurance Company for £122,800.

Among other recent sales of gas and water stocks, the following may be noted: A parcel of 500 fully-paid £10 shares in the Southend-on-Sea Water Company, paying 7 per cent. maximum dividend (the last dividend being at the rate of 5 per cent.) have changed hands at £7587 the lot. A parcel of 73 fully-paid £5 shares in the Redhill Gas Company made an average of £13 per share; and 69 £5 shares in the same concern, on which £4 each had been paid, fetched £10 10s. per share. A parcel of new £20 fully-paid shares in the Colchester Gas Company realized £34 per share. Five £10 shares in the Norwich Water Company have changed hands at £20 each. At Plymouth, last Thursday, Messrs. Body and Son offered for sale £4102 15s. of ordinary stock and £966 of 4½ per cent. preference stock of the Devonport Water Company. The ordinary stock was put up in lots of £100 each, which realized from £135 to £141; while the preference stock was sold in two lots of £400 for £546 each, and the balance of £166 for £211.

THE WORK OF THE CITY AND GUILDS OF LONDON INSTITUTE IN THE PAST SESSION.

In view of what the public have lately been told by a high authority on the subject of the progress of technical education in Germany, the report on the work of the Examinations Department of the City and Guilds of London Institute in the session 1895-6, which has just been issued, has special interest. The Superintendent of the Technological Examinations of the Institute is Sir Philip Magnus, who has long been identified with this important work.

It is gratifying to learn, from the opening sentences of the report, that the efforts of the department in the direction of encouraging in various ways sound technical instruction have been satisfactory. The aim has been rather to secure systematic training for artizan students than to increase the number of candidates for examination. Nevertheless there was an augmentation in this respect last session. The students in attendance at the registered classes numbered 29,494, as compared with 27,583 in the year 1894-5; and the number of candidates' papers examined was 12,099. Since the issue of the previous report, the number of new teachers whose qualifications have been provisionally or permanently approved has been 148; and the number of separate classes inspected to 196. The prizes awarded were 240—seven more than before. They consist of 218 money prizes, amounting to £440, given by the separate Livery Companies of London; and of 99 silver and 141 bronze medals, awarded by the Institute. The number of separate classes in technical subjects held during the past session was 1128—a considerable increase as compared with the year 1894-5—the registered students numbering 26,609, against 24,920. There were 10,364 individual candidates, as compared with 9992; 510 of them taking up two subjects, against 301 before. On the whole, the results of the year's examinations were satisfactory. The numbers of students examined and places at which classes were held were higher; while the failures dropped from 43·4 to 42·4 per cent. As the standard for passing was maintained, and even in some cases raised, this is a gratifying feature of the report. But to counterbalance it, there is recorded the somewhat disheartening information that the Examiners find the earlier education of the students defective; and express surprise that the candidates not only spell badly, but experience much difficulty in setting down in words what they really know. Attention was called in our editorial columns only a few weeks ago to some excellent advice given by Mr. Brudenell Carter on this very matter of clearness of diction; and an apology seemed almost necessary for alluding to the subject in that part of the "JOURNAL." The remarks in the report under notice amply justify the comments then made. Again, the Examiners complain of a "want of knowledge of drawing and of the habit of accurate observation on the part of the candidates." Why should this be? Surely instruction in representing on paper a form or figure present in the mind should be part of the *curriculum* of every Board School.

Turning to the portion of the report with which the "JOURNAL" is more immediately concerned, we find that 121 students of Gas Manufacture presented themselves for examination, as compared with 96 before. Of these, one passed first-class, 14 second-class, and 28 failed in the Honours Grade; while 25 passed first-class, 24 second-class, and 29 failed in the Ordinary Grade. There were 64 passes and 57 failures—the latter being at the rate of 47·1 per cent. In Electric Lighting, there were 412 candidates for the preliminary examination, and 219 of them passed; for the ordinary examination, there were 445 candidates, of whom only 195 passed. In Coal-Tar Colours, there were 17 candidates, and 10 of them passed. There was a total increase of 581 in the number of candidates, and of 439 in the number of passes; and there was an absolute decrease of 178 in the failures in the Ordinary Grade. There were 6263 passes, 4323 being new candidates; and 800 candidates passed in a higher grade, as compared with 703 in 1894-5. An examination was held last year for the first time in the very essential subject of electric wireman's work; and 34 candidates passed out of the 44 who presented themselves.

The report contains, as usual, extracts from some of the Examiners' reports. With respect to Gas Manufacture, it is stated by Mr. Colson that the papers in the Honours Grade last session were not nearly equal to those of 1894-5; while in the Ordinary Grade, the percentage of failures was higher. The papers which obtained a first-class pass were generally of greater merit than those of the previous year. But, unfortunately, as before, the answers to the questions indicated an absence of all-round training in connection with the subject. In Electric Lighting and Power, the Examiners (Professor S. P. Thompson and Mr. J. Swinburne) were struck with the exceedingly bad quality of the sketches and diagrams in the answers both to the preliminary and the ordinary papers. The candidates did not seem to have had any proper training in making dimensioned hand sketches, or in the correct methods of drawing electric circuits. The Examiners also note that a large proportion of the failures arose from the unreal nature of the information possessed by the candidates, and from the parrot knowledge which so largely does duty for an acquaintance with the subject. They remark that "candidates who cannot give simple answers to quite elementary questions in the technics of the subject, and waste their energies in calculating to many places of decimals numerical deductions from data having only three significant figures, cannot be regarded as qualified to receive certificates of efficiency in this branch of engineering. The conclusion seems inevitable that in many cases the teachers who are conducting the classes are not engineers at all, but possess only a book knowledge of electrical work. Such an inference is confirmed by the occurrence among the papers of batches of answers of which the consecutive numbering shows that they come from the same school or centre, wherein, in spite of the wide choice given to candidates from which to select, there is a lamentable failure to attain even a second-class pass." This is certainly not encouraging.

The Assessment of the Lancaster Water-Works.—The Water Committee of the Lancaster Town Council have decided not to proceed with the contemplated appeal against the increased assessment of their works, as recently noticed in the "JOURNAL" (p. 609).

The Disposal of the Gas-Works Profits at Keighley.—The profits of the Keighley Corporation Gas Department during the past year amounted to £10,020; and this the Gas Committee suggest should be appropriated as follows: Sinking fund, interest on loans, fire brigade, &c., £5739; and the balance of £4281 equally divided between the reduction of the debt on capital account and relief of the rates.

Projected Exhibition of Lighting and Heating Appliances at the Crystal Palace.—The Directors of the Crystal Palace have decided to celebrate the sixtieth year of Her Majesty's reign by having a National Commemoration, to which the entire resources of the vast establishment at Sydenham will be devoted. In connection therewith there will be a Victorian Exhibition, to be opened on May 24, one section of which will be devoted to illustrating the famous inventions in the arts and industries of the past sixty years. This section will include appliances for lighting and heating and the utilization of waste products. There will also be a series of fêtes and celebrations, as well as popular lectures on Wednesday evenings. The arrangements will be in the hands of the Manager (Mr. H. Gillman).

Colonial Gas Association, Limited.—At the eighth annual general meeting of this Association to be held to-day, the Directors will report a profit of £3116, which includes the dividend on the shares held by the Association in the Charters Towers Gas Company. In April last, the Directors declared an interim dividend amounting to £752; and after providing for interest on loans, &c., to June 30, 1896, there remains a balance, including the amount brought forward, of £1498. The Directors recommend a dividend upon the amount paid up per share for the second half of the year ended June 30 last, at the rate of 3 per cent. per annum, free of income-tax, which will require about £1129; leaving £369 to be carried forward. In their previous report, reference was made to the concession secured for the lighting of Geraldton. It is hoped that the works will be ready for lighting the town during their next winter. The Directors express great regret at the loss of the Secretary (Mr. G. J. Gray) through an accident, as recorded in the "JOURNAL" for the 13th ult., and acknowledgment is made of his services to the Association from its formation.

Richmond Water Supply.—An inquiry on behalf of the Local Government Board was held at Richmond a short time ago, by Mr. W. O. E. Meade King, M.Inst.C.E., in respect of an application by the Town Council for power to borrow £10,600 for purposes of water supply. The Town Clerk (Mr. Senior) explained that the district had a population of 24,000; and the rateable value was £201,876. The outstanding debt of all kinds was £237,794. The Borough Accountant (Mr. Richards) said the present debt in connection with the water undertaking, amounting to £47,932, was charged on the whole of the rateable value of the borough—£240,220—and not merely on that of the parish of Richmond. The Chairman of the Water Committee (Mr. Watney) pointed out by means of a plan the new adits proposed to be driven in connection with the existing works, for which, among other things, the money was wanted. The Borough Engineer (Mr. W. G. Peirce) gave details of the pumps put down, and of the various loans under which the expenses were met. Mr. W. B. Bryan, M.Inst.C.E., the Chief Engineer of the East London Water Company, expressed an opinion in favour of the adits, and said he thought it was a good thing to continue them at Richmond. Mr. Cockram put a number of questions, some of them quite irrelevant, to the witnesses. He did not condemn the scheme, except in so far as the mixing of the water from the Petersham well with the general supply was concerned—that water being, he said, impure. This, however, was denied.

DUNFERMLINE GAS-WORKS ARBITRATION.

Edinburgh—Monday, Oct. 12.

(*Before Mr.* H. E. JONES, M.Inst.C.E., *and Mr.* W. FOULIS, M.Inst.C.E. *Arbitrators. Mr.* J. SHIRESS WILL, Q.C., *Overman.*)

The proceedings in the above arbitration were continued to-day, at the Balmoral Hotel.

Mr. A. ASHER, Q.C. (Dean of the Faculty of Advocates), and Mr. KINCAID MACKENZIE appeared for the Company; and the Corporation were represented by Mr. T. SHAW, Q.C., and Mr. CLYDE.

In opening the case for the Corporation,

Mr. *W. Robertson* said he was sole partner of the firm of Hay and Robertson, linen manufacturers, of Dunfermline. There were 1635 gas-jets in use in their factory; and their last year's gas account, after deduction of discount, amounted to £317. They had an electric light installation in the factory. At present there were 220 lights attached; but the dynamo was capable of supplying 1200 lights. It was their intention to extend the electric lighting, so as to wholly dispense with the use of gas. They had not done this yet, because during the past three years they had been adding so considerably to the number of their looms that they wanted to be quite sure of what reserve power they had on their engine. The result of their operations would be to obliterate the gas account altogether. They introduced the electric light because of the bad quality of the gas. Insufficient light in a factory meant imperfect work. He did not think the prospects of the linen trade were at all roseate.

Cross-examined: The linen trade had already to some extent been diverted from Dunfermline to Belfast; and he expected the diversion to go on increasing. They had made no provision in their works for such a misfortune when it came, because they had not found it necessary. They had gone on increasing their looms, and had put in about 300 additional ones during the last four years. He expected them to be fully employed. He could not say that any future tariff regulation would pass over him scathless; but he hoped it would. He had not looked up to see how many looms they had in 1890; but they might take it, roughly, that they had now about doubled their place from what it was in 1890. They were led to introduce the electric light into their works because of the unsatisfactory character of the gas. It was bad smelling gas; and it was also of very bad quality so far as lighting was concerned. It was being supplied from the old works. They had 1635 gas-jets; and there were five meters. He could not tell what was the entire meter power. He thought 480 lights was the power of one meter. The last meter was put in by Mr. Pooley as sufficient. That was last year. He quite admitted that he had not much love for the treatment he got from the Gas Company before he was independent of them. He had written complaining of the quantity or the quality of the gas since the Company went to the new works; but he could not give the dates. Apart from the insufficiency of the meter, he had made no complaint since the Company went to their new works; he was committed to an electric light installation by that time, and had given up complaining. He never heard the incandescent gas-light suggested for a weaving-shed before; and he thought that from the fact that the gas-pipes were being continually knocked against by ladders and other things, it would be extremely unsuitable for a factory. It would be impossible to have a bracket fixed rigid at every loom.

By Mr. FOULIS: There was a good deal of dust in their weaving sheds.

Re-examined: The dust would catch on the mantles of the incandescent lights. There was so much of it that the beams, &c., required to be swept down regularly.

Tuesday, Oct. 13.

On the resumption of the proceedings this morning,

Mr. *R. Cockburn Millar*, Chartered Accountant, of Edinburgh, said he had made a careful investigation into the books and accounts of the Dunfermline Gas Company. He met Mr. J. A. Robertson, who was retained by the Company in connection with these proceedings, and made an agreement with him in regard to certain figures. He differed from Mr. Robertson upon a variety of points; but in the evidence which had been given by Mr. Lass, he found that practically every one of these differences had been given up in his favour. There were, however, one or two points still remaining. Mr. Robertson altered the accounts of the Company, and also the balance-sheet. He did not agree with his alteration; and he found that Mr. Lass did not do so either. With regard to the remaining differences between Mr. Robertson and himself, the first was the £100 of allowance given to Mrs. Mackenzie. Mr. Lass and Mr. Robertson placed this to the net revenue account, while he put it into the gross revenue account. Field's "Analysis" treated superannuation allowances in this way; and it was the usual method adopted in gas accounts. This £100 came in place of a superannuation allowance. Mr. Lass and Mr. Robertson treated it as an exceptional payment; and he regarded it as coming in lieu of the ordinary superannuation allowance of the late Mr. Mackenzie. This would make a deduction from the figure in the revenue account in the statements put in by Mr. Lass; but it would leave the net revenue the same as he set out. It did not make any difference upon the last year; and neither did the question of the £50 of Directors' fees, which was the other point of difference. These two differences really did not arise now upon the accounts ending May 31, 1896. He might say that he quite agreed with Mr. Lass's method of treating the Directors' fees from the point of view of a person auditing and presenting the accounts to shareholders; but he thought this was rather different, when they were presenting accounts to the Court after the event, and knowing what the contingent liability existing at the date of the balance ultimately emerged into. Those entered into a prior year's accounts; and did not affect last year. The accounts of the Company had not been framed upon the usual lines. There were certain forms of accounts which were adopted under statutory regulation. Statutory companies had to comply with a schedule in the Gas-Works Clauses Act of 1871; but the accounts as framed by the Dunfermline Gas Company did not do this. Mr. Robertson attempted to put the accounts into the form required by the schedule. Extension and renewal of mains was one account, and meters another. The whole of the extension and renewal of mains was charged to capital; no allowance whatever was made for renewals or depreciation by a sinking fund. There was an account for repairs of mains, and for that alone. The practice of the Company in charging renewals of mains to capital was just illustrative of their great deviation from the ordinary form in keeping accounts, or rather from the method of treating expenditure. They treated the whole of the new meters and the cost of putting down the new works as capital. The result of charging renewals of plant and machinery to capital account, was that it had inflated improperly the book value of the works, which he thought could not be relied upon to give any indication whatever of the real value of the undertaking. There was an additional result from this—namely, that the revenue and the net revenue accounts of the Company, shown by the Company's accounts as well as by Mr. Robertson in the reconstructed accounts, gave an inflated indication of the real profit; and this was true also of the accounts which he submitted to Mr. Robertson—these having been framed on the basis of the books. The inflation affected both the capital, book value, and the real profit earned. He was unable to correct the accounts after the event, not knowing how much of the extension and renewal of mains account, for instance, was for renewal; and neither, he thought, could Mr. Robertson or Mr. Lass No accountant could have corrected them without information. If 5d. per 1000 cubic feet sold had been spent and charged to revenue, the revenue would have been £487 less per annum; and if the amount had been 5½d., the revenue would have been £592 less. He had prepared a statement showing the book value of the works from 1891 to 1896. Under plant and machinery, they had extensions of mains and renewals of gas-meters, and renewals of gas-stoves and renewals and removals of plant; and they had beyond this feu-duty £578 19s. 8d. All these items helped to make up the £62,309 of the present book value of the works. At May 31, 1893, the book value was £36,549. The inflation from that date was accounted for by the putting down of the new works. They simply treated the entire new and old works, for the purposes of the present valuation, as part of their capital. The present book value of the works would only have been to a small extent altered if they had had the old works going and the new ones also. When the Company forsook the old works, they realized £2719 for part of the plant. He could not tell at what it stood in the books, because the £36,549—as at May, 1893—included the mains and meters. He would not like to say that it stood in the books at £20,000; it was a matter of engineering. At all events, all that was realized upon removal was £2719. From 1871 onward, there was a sum of £9090 entered in the books as depreciation; but there was no writing down of the old works in 1895. He agreed with Mr. Lass as to the amount which had been written up on paper—that was with no value added to the assets. It amounted to £2384 and £10,262. There was nothing to show for this in real assets—it was written up. No further sum was written up on the book value; but renewals were all charged to capital account, thus, of course, inflating the capital value. He had no idea whatever of the amount of the inflation. There was a point on the meters which threw some light upon it. He found from the books that in 1871 the meters lent on hire were valued at £2013, and that there had been bought since and charged to fixed plant £2602; so that the amount of the meters included in the book value of £62,309 was £4616. He could not speak of the present value of the meters; nor could he say how much of this sum was for renewals. He was aware that the business of the Company was conducted from the year 1865 onward on the principle of having the price and the illuminating power regulated by the average of five towns in Scotland—Edinburgh, Glasgow, Paisley, Greenock, and Kirkcaldy. He also knew that the Company kept to this arrangement down to 1886; and that from 1886 to 1890 they adhered to it with the exclusion of Glasgow. He had made up a statement showing the prices charged, and the average prices of the four towns named, from 1892 to 1896 inclusive. The result was that, from 1891 to 1896, Dunfermline was charged more than the average of the four towns. Edinburgh was occasionally dearer than Dunfermline. The cheapest of all was Paisley. In 1896, the average of the four towns was 2s. 11½d.; whereas the price charged in Dunfermline was 3s. 7d. The average of the four towns was this year down to 2s. 10½d.; while Dunfermline remained at 3s. 7d. The charge for prepayment meters worked out at rather less than 6d. per 1000 cubic feet. He had no information as to whether the rates in the other towns were with discounts or not. So far as he could see from the Company's minutes, they took no account of discount in settling the prices; and he did not do so either. In Dunfermline, there was a differential rate. Consumers in Townhill, which was an outlying portion, were charged 4s. 2d.; and in Venture-fair, which he believed was farther out again, the charge was 4s. 7d. In Townhill, the consumption last year was 669,800 cubic feet.

By Mr. JONES: He agreed that the net price was 3s. 5·05d., after deducting discounts and bad debts.

Examination continued: The proportion of bad debts was 0·40d.; making the price for gas, less discount, 3s. 5·45d. He knew that there was a discount in Edinburgh to large consumers; but he could not speak from memory as to Glasgow. In Kirkcaldy, there was no discount except in the case of the public lamps, where it was 25 per cent., which he thought worked out at about ½d. per 1000 cubic feet. In 1894-5, the price would have been less than 3s. in Dunfermline, under the agreement; and leaving out Glasgow, the average price would have been 3s. 0½d. In 1896, if they took the average of the four towns, there would have been a decrease of 7⅛d. in price, and of £1755 in revenue. By keeping up their price, the Company were enabled to increase their dividend from 6 to 10 per cent. In his opinion, the data for fixing the number of years' purchase could not be safely arrived at from anything shown in the books. The books did not disclose maintainable profit in any sense at all; neither did the statements which had been put in. They merely furnished data upon which the Arbitrators would require to make calculations, in order to arrive at a fair maintainable profit. It was scarcely for him to express an opinion as to whether, under present conditions, the price of gas could be maintained at 3s. 7d. prior to these proceedings. He was aware that the price of coal fell in 1895-6; and no reduction occurred in the price of gas. In 1891, the average price of coal per ton was 14s. 5·15d. The average

from 1891 to 1895 was 13s. 4d. per ton; and in 1896, it was down to 10s. 7d. The cost of coal per 1000 cubic feet of gas was: In 1891, 22·16d.; in 1894, 18·9d.; and in 1895, 20·3d.—the average for the five years being 21·2d. In 1896, it was 14·3d.—a decrease of about 7d. per 1000 cubic feet. He had not gone back on the coal accounts prior to 1891. The net profits were from 14d. per 1000 cubic feet in 1891 up to 17d. in 1895; the average for the five years being 14·38d. In 1896, the net profits per 1000 cubic feet went up 7d., or thereby, over the average of even the previous five years.

By Mr. FOULIS: There was a record of the quality of the coal used in 1891-2-3, as compared with the quality in 1894-5-6. He had prepared a table of all coal, which he put in. It was a statement of coal bought in the years from 1890 to 1896.

The OVERSMAN: Is this table intended to show whether the coal consumed in this period from 1890 to 1896 was coal of the same character?

Witness: I am an accountant, and am not particularly acquainted with the qualities of coal; but I went carefully through all the invoices, and from that information alone (I was denied any explanations by the Company's servants), I had to separate the common coal from the cannel. On one or two particulars, the table would differ from that which would have been prepared by the other side; chiefly on account of an item called "jumbo nuts," which I have included under the head of common coal, and which the other side say is cannel. I made the best inquiry I could; and I was told it was common coal.

Examination resumed: In the three years between 1891 and 1894 the Company set aside sums amounting to £1300 to reserve fund. Nothing was done in that way in 1895-6. The reserve fund was represented on the asset side of the account, which included the enormous inflation—an inflation considerably greater than the amount of the fund. To some extent, he thought the 1895-6 dividend was paid out of capital. He had looked at the Company's revenue and net revenue accounts for the years from 1890 to 1896, and had prepared a statement, which he put in. The profits brought out were practically those stated by the Company, but subject to adjustment on account of various items—such as tear and wear, renewals, and the question which had been raised as to the price of gas. The expression "net revenue" was designed to show the free balance of revenue applicable to dividend purposes. The average of the revenue account for the five years prior to 1895-6, as shown by the books themselves, was £3230. In 1895-6 the profit was £5164; and the average of the six years was £3552. He did not think it would be safe to proceed upon a single year, such as 1896, when they were confronted with such averages as those he had given; the prices of coal and residuals being important elements.

By Mr. JONES: Off the average profit for the six years, he took the interest on the mortgage debt, which was £476; and this being deducted, there remained as the average of these years the sum of £3076. Out of this sum would require to be provided a proper allowance for tear and wear, depreciation, and sinking fund. The amount needed to pay 6 per cent. on the present capital was £3020.

Examination continued: The gas made in 1892 was considerably more than in 1895-6. The accounts showed a fluctuation in the business, and that for the last four years it had practically been stationary. He did not think this was a case where the profit of the last year could fairly be taken as a maintainable one. He should say there was high authority for a difference between a statutory and a non-statutory company. On this authority, it had been stated that a statutory company was worth 25 per cent. of years' purchase more than a non-statutory one. The high authority to which he referred was Mr. Jones, in the Stourbridge case. As to the number of years' purchase, he adopted Mr. Lass's position; and he gave no evidence as to that. It was stated in the "JOURNAL OF GAS LIGHTING" that Mr. Jones said it had been the custom to allow 25 per cent. more in the purchase of a statutory company than in the case of a non-statutory concern. It also said he admitted that, if the company were selling by agreement, he could not allow 10 per cent. for compulsory purchase. He (witness) had made inquiries with regard to the yield per cent. of Scotch companies. The lowest of them was Kirkcaldy—£3 14s. 9d. He thought the reason given by Mr. MacPherson would account for this. When a company limited their dividend to 7½ per cent., though they were making a much larger profit, they added to the stability of the undertaking. Any shareholder buying the shares would be in the position that he could not draw more than 7½ per cent., unless the Company resolved to alter their Articles of Association. With regard to the other companies, they ranged from £4 6s. 6d. to £5. He had not calculated the average; but he thought it would be about £4 10s.—perhaps rather more. He based his statement on communications with companies, and in some cases on offers of shares. He did not think the return of 3¾ per cent, spoken to by the Company's witnesses, would be at all adequate. It was an industrial undertaking, involving various risks, some of which, in his judgment, were serious. There had been considerable fluctuations in the value of all gas shares. Prior to their proceedings, in 1895, there were various sales of the Company's shares at from £28 10s. to £29 10s. The sales were in December; and the dividend was only half accrued. The dividend was 50s. per share in 1895-6; and prior to that it had been 30s. per share. Taking the full purchase figure of any transaction prior to these proceedings, and multiplying by the number of shares, the capital figure was £59,398—this was on the footing that the purchasers should take over the liability for the mortgage debt, and without paying anything for stores or liquid assets, and supposing that all the shares had been sold. It was what the shares would have sold at prior to these proceedings, if the shareholders had been willing sellers, and had sold even at auction.

Cross-examined: He was not sure whether it was quite clearly brought out in Mr. Lass's statement that the figure under the head of depreciation—£6981—was, as he believed, depreciation written off from the beginning of the Company down to 1871. Mr. Lass said it was from 1854; but he (witness) thought that in 1854 there was a sum of accumulated depreciation brought forward. Then the next figure—£9090—was stated to be depreciation from 1871 to 1891. The balance of £62,309 brought out by Mr. Lass was the same as in his statement; but his difficulty was that he could not accept it as in any sense the net amount expended. What he felt was that it was impossible to put these accounts in the statutory schedule form; and one inevitably fell into error in trying to do it.

Mr. ASHER: Do you dispute that the total expenditure on the works, plant, mains, and meters was £62,318, as appearing in the books?

Witness: Yes; but it contains a great deal which was not, in the sense of the schedule, capital expenditure.

Do you dispute that there was a sale of material to the amount of £3585, as credited?—It is not quite accurate, but not far wrong.

Cross-examination continued: There were sums brought forward on the credit side of the account, which were entered under the heading of old apparatus; and they were re-used and debited again and again, which magnified the sum. His difficulty about the depreciation of £16,071 was that a question was raised in his mind, as an accountant, as to whether this sum was anything like the amount of their renewals. The books showed that amount written off; but he suspected it was not real depreciation at all. He admitted that the books showed capital written up to the amount of £12,647, without any expenditure against it at all. He corrected Mr. Lass's statement merely in the matter of dates and headings. He had not investigated as to whether, at the date of the agreement in 1865 as to the price of gas, the supply in the five towns mentioned was in the hands of private companies or not. With the exception of Kirkcaldy, the supply in all the towns was now in the hands of the Corporations; and there was, of course, no dividend to pay. In a statement which was made by the Provost in October, 1895, he said that the Gas Company repudiated the agreement, on the ground that, whereas the works in the five towns named were at first in private hands, four of them had since been acquired by the respective Corporations; and this was quite accurate. He believed that the only difference between the table produced by the other side and his was that he had lumped the cartage and the price of coal together. It was true that the coal had to be carted in 1895, whereas there was no expense under this head in 1896. He put the two items together, not for the purpose of contrasting the price of coal in 1895 and 1896, but to comply with the schedule in the Gas-Works Clauses Act. This would have represented the difference in the price of coal between the years 1895 and 1896 inaccurately to the extent of the amount of the cost of cartage; but he might explain that the Company's accounts, as stated, were practically the figures given them, and it was the Company's side who took out the cartage in order to show the difference. He thought it was an improper thing to do.

Mr. ASHER: Do you really suggest that the accounts put before this Court should have been in such a form as not to enable them to see that the price of coal in 1895 included something for cartage, and in 1896 it did not?

Witness: I think it was wrong to put the accounts forward in that form; but it was quite right to tell the tribunal the fact.

Mr. JONES: Surely the more details they give the Court, the more information they would furnish. It was not wrong in the sense of being misleading?

Witness: I do not suggest that for a moment; but the table produced by the Company is inapplicable for purposes of comparison with Field's "Analysis," and all recognized statistics of gas. My table was prepared to be suitable for comparisons of that kind.

The OVERSMAN: In your evidence, you drew a contrast between 21·24 and 14·30; and at the moment that struck me as a very forcible comparison. But it is now pointed out that it is inaccurate and unreliable, because there is no longer any cartage?

Witness: Yes; that is a necessary part of the comparison—it is a necessary item in the cost of coal, *qua* the Company. The Gas-Works Clauses Act tells you to add cartage of coal, and labour connected with it. We have done that; and for purposes of comparison it was absolutely necessary that I should put these in as coal. That is the coal account in the books, and not really the price paid per ton; it is the coal *plus* the cartage, and *plus* the labour. Witness went on to say that the detailed table which he had put in, of the cannel and the common coal, and the total, showed not only the item of cartage but all the other subjects stated separately, so that the tribunal had the fullest information for deciding upon this point.

Mr. FOULIS: In the detailed table which has been put in, are these the prices at the railway siding, are they the prices at the works, or what are they—because that is important?

Witness: I am not sure. In some cases it is quite possible that the prices may be at the pit head; and in others, at the works. But where they are pit-head prices, you will find the cartage added.

I have got here the prices at Dunfermline station; so that I suppose the detailed prices that are given throughout are the prices at Dunfermline station?—Yes; I believe they are so.

Cross-examination resumed: In his opinion the rise in the profit in 1895-6 was due to the high price charged for gas compared with the low price at which coal was purchased. Another explanation of the high profit in 1895-6 was that there was less coal used and a larger make; but this was more a matter for the engineers to speak to than for an accountant. In 1895-6 the quantity of cannel used was greater than in 1893-4; and the amount of common coal was less.

Mr. FOULIS: Allow me to say again that unless you intend to put in an analysis of the coals, the mere statement as to cannel and splint is simply misleading.

Mr. JONES: I quite agree with you.

Mr. ASHER: That is probably bringing the matter back to the position Mr. Lass took up, when he scored the cannel out of our tables.

Cross-examination continued: There was more gas made in 1893 than in 1896; the figures for the respective years being 69,180,000 and 65,187,000 cubic feet. Apparently, therefore, down to 1893, and until the circumstances occurred in 1894 which had been pointed out, there had been, with very slight interruption, a gradual increase in the make of gas. They had to go back to the years 1878 and 1880 for fluctuations; and then it immediately began rising again. In 1896 it got higher than in any year except 1893.

Re-examined: His suspicions were aroused at the smallness of the amount for depreciation, compared with the extent of the concern, and the fact that the renewals of mains and meters were charged to capital. He thought it had been proved that his suspicions had been fully warranted.

Mr. SHAW: Have you any idea why the "jumbo nuts" were entered as cannel, and not as ordinary coal?

Witness: It was not done by the Company, but by Mr. Robertson. I thought it looked strange; and I asked about it at the works, but was told that no information could be given. They were allowed to produce their books to me; and I asked them to show me a sample of these "jumbo nuts," because I thought I could myself tell the difference between cannel and common coal. They would not, however, produce a sample. The next thing I did was to go to the Fife Coal Company, who also quote "jumbo nuts;" and they told me that they were common coal.

Mr. JONES: You have shown that the price of gas has fallen in the four or five towns you mention, while Dunfermline has stood still. Can you tell me whether any of these other towns have been largely reconstructing works?

Witness: I do not know.

With regard to transferring works, as a financier you can understand that must add to the capital?—No doubt, it would add to the expenditure, but not to the good value. So far as I can judge of the intention of the Legislature, all renewals should at once be written off the revenue account.

Apart from the Legislature, just think of the position. The Company were departing from old, worn-out works having no margin; and they wanted larger works with a margin of power. Having a margin of power, you would expect the works to cost something additional to capital?—The right thing is to foresee that, and to provide for it by writing off something from capital. To the extent to which the works are larger, they are entitled to charge that to capital account.

Do you agree that in 1896 the works can, by the expenditure of some capital (whether £12,000 or £20,000), be made to do from 150 to 250 per cent. above their present make?—I can say nothing whatever about that. In some respects the works are no doubt in excess of their present use.

By Mr. FOULIS: He agreed with Mr. Lass that at present there was a considerable amount of the capital which was stated that was not represented by any actual value. This amount seemed to be rather over £13,000. As an ordinary business transaction, the Company would require to write down this £13,000 to make their books right. That was Mr. Lass's evidence, and he entirely agreed with it. That figure, at £650 per million, was £38,038; and Mr. Woodall's valuation for the excess works was a little over £6000, which made £44,000, as against £62,000.

Mr. FOULIS: I have been trying to get from various witnesses, and I should very much like to know, the lighting power of the gas of this Company in previous years. We have got it for the last three years; but I have a strong impression that previous to that it was much higher. In 1890, as far as I can make out from the agreements, the Company stated that they were bound, and were complying with the obligation, to make the gas of the same quality as in Edinburgh and other towns. There is another point I want to have made perfectly clear. It was stated that in 1886 they excluded Glasgow, because of certain changes that had taken place there; and it was suggested that this change was that the gas supply there had been transferred to the Corporation. The transfer, however, took place in 1869, so that could not be the cause. But in 1886 we reduced the illuminating power of the gas in Glasgow from 25 to 20 candles; and I think that is the change they were alluding to. This would seem to establish the fact that, at all events down to 1890, the Dunfermline Company were supplying gas up to 25 candles. I want to get that clear; and if any evidence can be procured upon it, I should very much like to have it.

Mr. SHAW: We will endeavour to get that.

Mr. *Charles Hunt*, M.Inst.C.E., said he had examined the accounts of the Dunfermline Gaslight Company, as spoken to in the case, and he had also inspected the works. He was aware that this was a non-statutory Company, subject to risk of competition, and being under no obligations in regard to price and quality except those embraced in the agreements which had been mentioned. With regard to the capital account, he observed that prior to 1891 the capital was written down periodically by depreciation charged against revenue. The total amount so written off for depreciation was £14,178. On two occasions, however—in 1871 and 1891—the capital was written up by adding to the value of the shares the amount of £17,332. There did not appear to have been any valuation of the Company's assets by an independent valuation previous to the writing up of the capital in 1891. It was just a paper entry, and nothing more, so far as he could judge. From this amount of £17,332, there had to be deducted positive assets existing at the time of winding up, in the shape of premiums received, shares sold, and so on, amounting to £6160; leaving £11,172 as the amount written up without assets to cover it. Since 1891 the practice of charging renewals to capital had been continued, so far as he could ascertain. For instance, during the last five years the accounts showed there had been debited £1080 of capital for meters purchased. During this period he saw that, as a matter of fact, the number of consumers had actually been reduced by 98—viz., from 3949 to 3851. Beyond the sum of £69, written off in 1894, he did not think anything had been written off capital for depreciation since 1891. In the interval, the original storage plant and manufacturing works had been totally abandoned, and new ones erected. Nothing had been written off capital on account of abandoned works, except £2719 received for the site and old material; and this was certainly not in accordance with practice or propriety in book-keeping. The effect of this treatment of the capital account was that on May 31, 1891, the book value of the works and plant, after the capital had been written up, was shown to be £33,913. This was at the rate of £4 18s. per ton of coal carbonized, or £627 per million cubic feet of gas sold. As the books stood at that time, he thought this was a reasonable enough position. On May 31, 1896, the book value had increased to £62,309. The whole of the new works were charged to capital, and nothing was written off for works abandoned. The new figure of £62,309 worked out at £9 10s. 2d. per ton of coal carbonized, or £1065 per million cubic feet of gas sold. This was certainly unusually high; and assuming the books to have been kept on the principle of writing off, a figure of this kind would never have been reached. It was a mere paper figure. The book value had increased in five years by no less a sum than £28,395; and per ton of coal carbonized, it had nearly doubled. He had prepared a statement which showed that the total amount of actual present assets of the Company was £44,579. This valuation was largely derived from the books of the Company; and the distributing plant was valued by himself. With regard to the new works, which were by far the largest item, he had had the accounts themselves laid before him. He might say that he valued the distributing plant at new prices—that was, supposing there was no distributing plant in Dunfermline at all, that would be the price they would have to pay to lay it down. He thought the figures he had given were thoroughly reliable. The amount of £44,579 was what he represented as the real assets of the Company. There was no deduction whatever made from this figure for depreciation. Taking this sum from the book value, there was a deficiency on capital account of £17,730. If they deducted the item of feu-duty erroneously charged to capital, the real inflation of book value, above actual value, was £17,151. To this, however, there fell to be added a certain item with regard to distributing plant. He was deducting nothing for depreciation on the new works; but he thought that the depreciation would be very moderately stated at one-third of the distributing plant (£4675), which would make the total deficiency £21,826. Deducting the £4675, which reduced the distributing plant to its true value, from his total of £44,579, he made the total real value of the concern, as at this date, £39,904. The amounts divided as profit did not appear to have been affected by the writing up of the capital on the two occasions referred to—at any rate, not immediately. In 1891, for instance, the amount paid in dividend was £2546, or at the rate of 10 per cent.; and in the following year, when the capital had been written up, the amount paid in dividend was the same—being 7 per cent. on the increased capital. Calculated per 1000 cubic feet of gas sold, the dividends from 1868 downwards showed considerable regularity. From 1868 to 1877, the dividend was at the rate of 1s. 0¼d. per 1000 cubic feet; from 1878 to 1887, it was 1s. 0¾d.; and from 1888 to 1895, it was 11·78d. In 1896, the dividend jumped up to 1s. 8·56d. per 1000 cubic feet sold. He had no idea as to the reason which influenced the Company to declare this large dividend. It was possible that the imminence of these proceedings might have had something to do with it. Otherwise there were prior claims upon any increased profit, in the shape of a reduction in the price of gas, and of the depreciation on capital account. He thought this was manifest. The figures he had given did not include interest on loans, &c. They would slightly increase the amounts divided during the years 1868 to 1871 inclusive; and during this time the capital varied from £4000 to £5200. In 1892-3, £9500 was borrowed; and this was increased to £11,900 in 1894-5. The interest on this loan, less the interest on the bank deposits, amounted to 1·79d. per 1000 cubic feet of gas sold. Adding the 1·79d. to the 1s. 8¼d. paid as dividend on share capital, made a total charge of 1s. 10·3d. per 1000 cubic feet, for dividend and interest, in 1896. He thought it was clear that this was greatly in excess of the customary charge for dividend and interest. It was usual for the dividend and interest charges to diminish per 1000 cubic feet rather than increase, owing to the lower rate of interest which was generally paid on new capital. This was because the return given by these investments was less now than it used to be, and it was easier to borrow money on them. The average charge for dividend of all the Provincial Companies named in Field's "Analysis" for 1895 was 8·84d. per 1000 cubic feet of gas sold; the highest being 12·12d. Dublin figured at 15·9d.; but this was very exceptional. The dividend paid by the Kirkcaldy Gas Company worked out at about 8½d. per 1000 cubic feet sold. In recent years there seemed to have been a decline in the Dunfermline Company's business. From 1868 to 1878, the increase, calculated on the gas made, was about 60 per cent., or at the rate of about 6 per cent. per annum. During the next decade, it was again 60 per cent.; whereas in the last nine years the increase, calculated upon the gas sold, was only 31·8 per cent., or at the reduced rate of 3½ per cent. per annum. This certainly showed that the relative rate of increase had been growing smaller. The last five years showed an increase of only 8·2 per cent. or an average of 1·6 per cent. per annum—nearly the whole of which, or 7·2 per cent., occurred in the very last year. For the last nine years, the figures indicated a growth, but a slow one. With regard to the works, he had one observation to make. He considered that the settings were larger than was convenient for works of this size; the productive capacity of a single setting being in excess of the minimum consumption during the summer months. This necessitated there being a short charge during a part of the year, which resulted in an increase of tear and wear and in the consumption of fuel. He took the minimum weekly output from the carbonizing book for the past year; and he found it to be 407,000 cubic feet. He also took the maximum weekly output from the carbonizing book; and it was 2,694,000 cubic feet. With regard to the boiler and exhauster, they were not in duplicate; and without their being so, he did not think that works of this size could be regarded as complete. He thought that the inconvenience would be considerable, and the loss through leakage of gas very appreciable, if there were any breakdown. He thought that the purifiers were equal to more than the present make; but he considered that there was no more scrubbing power than was necessary. He understood that the maximum daily make last winter was 454,000 cubic feet. He reckoned that the purifiers were equal to nearly, if not quite, double this quantity. The capacity of the gas-holders was 575,000 cubic feet—equal to about a day and a quarter's supply of the maximum output. He had made an estimate of the value of the buildings and plant which had been provided in excess of present requirements; and he produced it. This estimate amounted to £3620. He considered this was a fair estimate of the value of the excess works.

Mr. FOULIS: There is great confusion in my mind as to what surplus plant means. A railway siding may be put down; but we cannot put down half of one and balance the account by coal service. I should like to know what surplus plant means.

Mr. SHAW: This applies to four items only; and among others, to the extra length of the retort-house and coal-store.

Mr. FOULIS: Then one would naturally say, Why build it?

Examination resumed: That was £1670; and then there was half the structural value of the purifying house and apparatus. There was at present expended upon them £3620, which, so far as the present

necessities were concerned, was dead capital. All the calculations that had been made with regard to the profit, and so on, had been on the footing of including this dead capital.

Mr. FOULIS: All I mean to say is that there are some things that must be repeated—for instance, you cannot build half a gasholder. On the other hand, if the retort-house is twice the length which is necessary, I should naturally say, Why build it twice the length?

Witness said he thought that in building works, it was wise to provide for a moderate increase. He did not say that the provision in this case was in excess of what might be required. He valued these things as surplus works in view of the present necessities of the works. He was afraid that the surplus works were providing for about 30 years ahead at the present rate of increase. The average wages for receiving and storing coal for the last two years were 3½d. per ton above the preceding four years. The wages for gas making cost, in 1896, 2s. 10·34d. per ton of coal carbonized, as against 2s. 9·42d. for the preceding four years at the old works. These figures showed a total increase at the new works of 4·42d. per ton of coal carbonized. This was equal to more than half of the saving which had been effected in cartage by the removal of the works to the railway. He thought this was mainly to be accounted for by the fact that all the coal had to be wheeled through the coal-store to the retort-house from the siding. He made a personal examination of the distributing mains at about fifty different places; the ground having been opened by the Corporation for the purpose. Most of the mains he considered were much too small for their work, and some were laid at an insufficient depth to secure protection from the traffic. The same might be said of the service-pipes. He did not think he saw any service-pipes larger than ¾-inch.

Mr. FOULIS: Was that because the service pipes were all for very small houses?

Witness: Possibly; but a ¾-inch pipe I consider very small. I understood there were many smaller than that.

You were not surprised, I suppose, looking to the position of the works, to hear that the maximum pressure at the works was 32-10ths?—It was that, I understood, last winter.

The OVERSMAN: How do you make it 32-10ths?

Witness: By information from the Manager when I was at the works. I made a note of it at the time.

Mr. FOULIS: I suppose they have not a pressure-register.

Witness: I do not think they have.

Examination resumed: Owing to the insufficient size of the mains in many parts of the district, he thought it must be difficult to avoid giving extra pressure, particularly in the higher levels, relatively at the new works as compared with the old. Excessive pressure meant undue leakage; and this had a tendency to increase rather than to diminish in the course of years. His evidence was that many of the mains—indeed, most of them—were much too small. There were a great many of them from 2 to 7 inches in diameter; and he should say there should be none less than 3 inches. Any company relaying these mains would put down 3-inch pipes. Some of the mains were at insufficient depths, which rendered them more liable to damage from the traffic and frost. In his opinion, considerable expenditure would be necessary in enlarging the mains and service pipes in order to bring the works into a satisfactory condition. There had been a very small amount expended upon repairs of meters. This suggested to him that extensive overhauling would be required. There was a comparatively large amount in the present year for new meters; and this confirmed his view. It was evident that the Company were alive to the fact that they certainly needed overhauling. The dividend last year amounted to £5012; being £2142 in excess of any previous division, and about £300 more than the Company actually earned, after providing for the mortgage interest. This could not be a defensible proceeding. To keep the Company safe, it would have required that they should have applied the money not to increasing the dividend, but to reducing the price of gas, and making provision, by depreciation, for the large deficiency on capital account. He did not go the length of saying there should have been an actual reduction of dividend after the expenditure of so much capital in the improvement of the undertaking. On the other hand, to increase the dividend under the circumstances was, he thought, unfair to the consumers, and involved risk to the stability of the Company. To arrive at the fair maintainable profit of the undertaking, something must, in justice, be taken off the selling price of the gas. The price in Dunfermline had remained at 3s. 7d. since 1891, with the exception of 1893, when, he supposed on account of the rise in the price of coal, it was 3s. 9d. In contrast to this, in all of the five towns mentioned in the agreements, there had been the following reductions: Edinburgh, from 3s. 9d. to 3s.; Greenock, from 3s. 4d. to 3s.; Paisley, from 2s. 10d. to 2s. 6d.; Kirkcaldy, from 3s. 4d. to 2s. 11d.; and Glasgow, from 2s. 6d. to 2s. 2d. Accordingly, if the agreement had continued, the price would now be 2s. 9d. per 1000 cubic feet, or 2s. 10d. excluding Glasgow. The nearest of these five towns, as a standard of comparison with Dunfermline, was, he thought, Kirkcaldy. It stood nearest both in point of size and locality. In locality he included the all-important item of proximity to the coal-fields. There was also, he thought, a further element in the case of Kirkcaldy, in that it had, from the beginning, remained in the hands of the original Company. It was also the smallest of the five towns mentioned, and most nearly approximated to Dunfermline in population. According to the last balance-sheet, the value of the works, plant, &c., at Kirkcaldy was £42,647; and the share capital was £36,950. The consumption of gas per mile of mains in Kirkcaldy was stated to be 2,140,000 cubic feet, as against 3,500,000 cubic feet in Dunfermline. The percentage of unaccounted-for gas was 10·9, as against 8·59 in Dunfermline. These were important elements in favour of Dunfermline, and of the power of the Company, if just to their consumers, to reduce the price of gas. The works at Kirkcaldy were at a distance from the railway, which involved cartage of coal and material. This, again, was in favour of Dunfermline to the extent, he understood, of about 8d. per ton. The illuminating power of Kirkcaldy gas was stated to be from 25 to 26 candles, whereas in Dunfermline it was only 22·46 candles, taking the monthly average of the Engineer's tests. He assumed that the difference in cost should, as nearly as possible, be 3d. per 1000 cubic feet; and he might say he was confirmed in this by a comparison he had made in the case of coal at each place. This was for illuminating power; and to it they must add something for cartage. This made 3·8d. per 1000 cubic feet of gas sold in favour of Dunfermline, on cartage and illuminating power. In this percentage a certain allowance had to be made for meter-rents in favour of Kirkcaldy, which received 1d. per 1000 cubic feet more than Dunfermline. Deducting this, there was still left in favour of Dunfermline, in round figures, 2¾d. per 1000 cubic feet. Allowing for discounts, the net selling price in Kirkcaldy was now 2s. 10½d. Compared with this, the net selling price in Dunfermline was 3s. 5½d. per 1000 cubic feet. He had worked this out upon the results shown in Mr. Lass's statement. The average discounts were 4 per cent., which worked out in Dunfermline at 3s. 5½d. So that in Dunfermline they paid 7d. per 1000 cubic feet more for gas, which yielded 3-candle power less light, when compared with Kirkcaldy. If the price in Dunfermline were to be reduced to that in Kirkcaldy, this would be a reduction of 7d.; and Kirkcaldy would still have the advantage in illuminating power. He thought, however, this was a fair set-off against the much larger capital in Dunfermline. Making allowance for the higher amount they had to pay interest upon, chiefly owing to the new works (he thought the Company were entitled to a moderate dividend upon that), it would be fair and reasonable to deduct 7d. per 1000 cubic feet sold, less discounts amounting to 4 per cent., from the balance of revenue account. This would leave 2¾d. per 1000 feet which consumers in Dunfermline would be paying more than those in Kirkcaldy, having regard to the illuminating power. This was even after they had deducted the 7d. He had endeavoured to be fair. The revenue account showed an expenditure of 2·8d. per 1000 cubic feet for repairs. There had been no outlay upon regenerative furnaces and retort-settings for the last two years; and this would be an additional source of expenditure for maintenance. There was, comparatively speaking, a large number of meters and connections of the smaller size. This must entail a greater cost for maintenance than was usual in the case of English undertakings. The cost of a small meter was greater, in proportion to its size, than that of a large one. For instance, a two-light wet meter cost 28s., or 14s. per light; and a ten-light one, 7s. 9d. per light. He found from the Board of Trade returns, that there were 68 gas companies in England and Wales whose sales ranged from 40 to 80 million cubic feet of gas per annum. The average annual consumption per consumer of these 68 companies was 32,236 cubic feet. In Dunfermline it was 14,182 cubic feet. This implied more than double the number of services and meters in Dunfermline than was usual in England and Wales. He adopted the figure which Mr. Lass gave in evidence, and in his paper, as to the sum to be set aside annually for renewals—1¼ per cent. His valuation of the works and plant of the Company amounted to £44,579. Applying the 1¼ per cent., he obtained a sum of £594 8s. to be deducted from the balance of revenue account. This 1¼ per cent. he took, not upon the book value, but upon the actual value. This again, calculated at per 1000 cubic feet, was equivalent to 2·44d. In order to arrive at the maintainable profit, he first took the balance of revenue account for the year ending May 31, 1896, as shown by Mr. Millar—viz., £5164. To this he added the cost of removing and refixing the washer (being an exceptional charge during the year), £68; making a total of £5232. He then deducted from the selling price of the gas 7d. per 1000 cubic feet, less 4 per cent. discount, £1638; renewals, costing 2·44d. per 1000 cubic feet, £594; 4 per cent. on the loan, £477; and transfer fees, £3—together £2712—leaving £2520 as maintainable profit. He thought the Company should have made the price of gas 3s. last year, looking to their own stability and the interests of their shareholders. He multiplied the maintainable profit of £2520 by 22½ years, which, in all the circumstances, he considered was a reasonable and full multiplier. This brought out a sum of £56,711. From this he deducted the cost of an additional boiler, exhauster, and engine, £460; and also half the cost of laying 3-inch mains in place of all those of less diameter than 2½ inches. If he were asked to advise the Corporation of Dunfermline, having acquired this undertaking, what was necessary to make it complete and satisfactory, he should recommend the incurring of expense to the amount of £943. There were 9673 yards of mains 2 inches and less in diameter, for which he allowed 2s. 7d. per yard, *plus* 15 per cent. for irregulars and contingencies; making £1436. Then he allowed for enlarging 1000 small services, at 9s. each, £450. This made £1886, one-half of which he deducted from the valuation. On the other hand, there was to be added in favour of the Company the value of surplus works and plant provided in excess of present requirements, which he had estimated at £3620. This gave a total valuation of £58,938. With regard to the number of years' purchase, it was generally recognized that a deduction of 20 per cent. should be made in the case of a non-statutory as compared with a statutory company; so that, if a statutory company were worth 25 years' purchase, a non-statutory company would be worth 20 years. Having regard to the fact that money had become during recent years of somewhat less value, he thought that a fair multiplier would be 22½ years in this case. He allowed 2½ years on account of the less value of money. Had money remained on the footing of a few years ago, his multiplier would have been 20 years. His valuation was made, of course, on the assumption that the capital of the Company was intact. He took the value of the works, however, as £17,000 more than the present actual value. To the £58,938 there had to be added the loan capital of the Company to be taken over by the Corporation, amounting to £11,900—making in all £70,838. Then he deducted the £17,000, which left the net valuation at £53,838.

Mr. JONES: Can you have that £17,000 again, seeing you have a deduction of £594 for depreciation for the year?

Witness: The difference between the book value and the actual value is about £17,000, which they would have to write off.

Mr. SHAW: There would be another way of it—viz., if you were to take 1¼ per cent., not upon the structural value, but upon the book value, that would increase the £594 item so much per annum?

Witness: Certainly it would.

But you prefer to start with the fact of structural value, and then give 1¼ per cent. They must then reconcile the book value to the fact with which you started, by paying off the £17,000?—Exactly.

So that, roughly speaking, if you had taken your 1¼ per cent. on the

book value, and the book value had represented the actual situation, then, of course, the maintainable profit would have been decreased accordingly, and the ultimate sum, in either process, would have been £53,838?—I have not worked out the sum the other way; but that is the view of it.

Cross-examined: In his valuation, the sum which would go into the pockets of the shareholders would be £41,938—that was, deducting £17,000 from £58,938.

Mr. ASHER: Your view is that the shareholders should receive something like £3000 less than your own estimate of the structural value of these works? The structural value of the works, according to your evidence, is £44,579; and you would hand over to the shareholders in cash £41,938?

Witness: I do not know how it compares; but these are the figures.

They would get about £3000 less than the structural value?—I think that is very probable.

In the market the shares, when they turn up for sale, fetch £29 10s., which would make the capital, according to the market price, £59,398? My view is that the public pay a great deal too much for the shares. There is an inflated capital. The shares at £29 10s. are very much above their market-value. I say so seriously.

Do you not think that the inhabitants of Dunfermline would be better able to judge of the stability of the Gas Company's business than a Birmingham Engineer who came down to take a bird's-eye view of the situation?—No doubt they exercise their judgment—it is one judgment against another. The value of the undertaking depends to a large extent upon whether its income can be maintained. This is what a reasonable man, considering what he was to pay for each share, would have to take into account.

Do you place your opinion against those who have bought shares?—I give my opinion for what it is worth.

Cross-examination continued: The proper mode of getting at the value of an undertaking like this was to ascertain what was the annual revenue, and whether it was maintainable; and then to decide on the number of years' purchase which should be paid for the annual revenue. He accepted as a fact that the Company's revenue for 1896 was £5232. He also agreed that, looking to the present position, and the history of the Company, 1896 was the proper year to take. He quite assented to the view that the circumstances of the Company were so entirely different in the new works from what they were in the old, that the practice in the old works must be set aside. The principal item which he attacked in the £5232 was the price of gas, from which he knocked off 7d. He was aware that the Company was a non-statutory one; and so far as statutory restraint was concerned, they had a free hand. There was nothing which restrained them in the matter of the price of gas, except the necessity for acting prudently with reference to the stability of their business; and he thought this should be a very strong restraint. The very large profit they were making was a temptation to competition. In his experience in England, 10 per cent. was an exceptional dividend for new capital. Ten per cent. might perhaps be recognized by many statutes, on the original capital of a company about 30 years old; but since that time he did not suppose that any capital had been raised at that.

Mr. ASHER: Is it not familiar experience that flourishing gas companies in England pay 10 per cent. upon their capital?

Witness: On their original capital; but not on the capital they have raised in recent years.

Do you not think, if we went to Parliament now, all our present capital would be treated as existed capital, and that we should get a statutory 10 per cent.?—No; certainly not.

What is there in the history of this Company which leads you to think that they will lose their business unless they reduce the price of gas to 3s. per 1000 cubic feet?—I go upon the profits last year, which enabled them to divide about 1s. 8d. per 1000 cubic feet. I do not know of any case in recent years of an application to Parliament where the capital was divided up into new and old.

Then, when you suggest that if the Dunfermline Company went to Parliament now, they would not get 10 per cent., you can point to no precedent?—I should be very much surprised indeed if they were to get 10 per cent.

But you cannot furnish any precedent for the refusal?—No. I have not the tables before me; but I take it from you that, with the single exception of 1890, the price of gas in Dunfermline has always been 3s. 7d. per 1000 cubic feet, or more.

Do you find that the business of the Company has been in any way affected by that price?—I cannot trace it to the price; but certainly the business of the Company has not increased within the last ten years in proportion to what it did previously.

If it has been going on increasing, why do you say, in valuing it, that they must lop off 7d., or otherwise they would lose their business?—I say the circumstances last year pointed to the fact that there was room for competition.

You think that the paying of a 10 per cent. dividend, which you say was not earned and should not have been paid, would induce another company to set up opposition?—I think it offers a great temptation.

What, according to the profits of the Company, should have been the dividend last year, stating their accounts properly?—I say that down to 1896 their dividends were fair.

You say that they paid dividend out of capital, and that they should have applied part of their income to reserve and depreciation. Now, rectifying their accounts, taking off as much as you say should have gone to depreciation and reserve, and taking nothing out of capital, what should they have reduced their dividend to?—To what they paid the year previously—7 per cent.

So that the question whether you are to lop 7d. off the price of gas must be taken with reference to the 7 per cent. dividend?—Yes.

Do you really say because a Scotch company is paying a 7 per cent. dividend, another company is to set up to compete with them?—Certainly, because there is a marginal profit to do so.

Charging the same price for their gas as they have done for ten years, and paying no more than 7 per cent., the risk of competition is so great that 7d. must come off?—They have a margin of £2000—enough to pay 7 per cent.

If it is so tempting, why has there been no competition during the past ten years?—I have mentioned last year.

But they have been paying 7 per cent. for ten years?—But they have not made this large profit until last year; it is fully £1000 more.

May I take it that you would consider, from your examination of the works, that the stability of the £1000 is assured?—No, pardon me; the profit has been growing during the last two years.

You say that the profit went up £1000 last year. Would this be sufficient to induce competition?—I said that during last year an exceptional profit was earned; it was that exceptional profit. I am not sure that the £1000 would be sufficient to induce competition. It is the difference between the dividend they paid and the profit, which I consider is the margin.

You said the reason there had been no competition during the last ten years was that it was only last year the profit went up?—Yes.

Then it must be the profit of last year you look to as causing the risk of competition?—Yes; the difference between the dividend and the profit.

What has the dividend to do with it?—I have explained that the dividend was 7 per cent. previously; and I say that would come to £2800, which still leaves a margin of £2200. The difference between dividend and profit has a great deal to do with competition; there is such a large margin between the dividend and the profit earned. I consider the £1000 of additional profit earned in 1896 would be stable if the price of gas were maintained.

If the price of gas remains the same as it has been for the last ten years, or rather lower (and there has never been a word of competition during those ten years), why should you anticipate competition as the result of the last year's trading?—For the reason I have already given, that no other year shows such an increase of profit, or such a difference between the dividends paid and the amount of profit. I quite agree that this being a private company, and entitled to do what they like, the only risk they run is that of competition.

Have you not reached your 7d. of reduction, not upon the basis of estimating the risk of competition, but on a comparison with Kirkcaldy?—On comparison with Kirkcaldy certainly.

What has the price of gas in Kirkcaldy got to do with the risk of competition in Dunfermline?—Kirkcaldy has got a great deal to do with the competition, because it was one of the towns which were included in the original agreement.

I suppose you were present yesterday, when it was said that a great many of the shareholders in Kirkcaldy are very large consumers, and that by their influence the price of gas has been kept down. Does that not make a comparison between Kirkcaldy and Dunfermline altogether untenable?—I do not know that fact at all.

But suppose it were the fact, would not that make a comparison with Kirkcaldy, in valuing Dunfermline, practically absurd?—I doubt if it would. If the price of gas were kept down to suit the wishes of large shareholders, that must affect the profits of the Company.

Would it not displace Kirkcaldy as a fair standard of comparison with Dunfermline for purposes of valuation?—I do not know to what extent it would,

But it would displace it, would it not, for a standard of comparison as regards the price of gas?—No; I do not think that it would.

Do you really say that if you had a town in which the shareholders of the Company are large consumers, and because of that keep down the price of gas, that this price should be applicable to a town where there is no such element?—Surely the shareholders, although large consumers, would not consent to be supplied with gas at a loss. There must be a reasonable percentage upon capital.

You do not treat that as a matter of no importance?—No.

Mr. JONES: Surely, if a man burns more gas than he receives dividend, does not the larger interest lie in keeping down the price of gas?

Witness: He has to consider the other shareholders who are not consumers.

Mr. FOULIS: Had you ever any instance in all your experience?

Witness: No.

Cross-examination resumed: He really could not assume such a thing to occur; it was very difficult to assume it. He did not remember hearing it sworn to. If the consumption of gas increased, it would yield a margin for the reduction of the price of gas without reducing the profit, supposing other conditions remained the same. The amount per 1000 cubic feet which he allowed for repairs and renewals was 5·224d. This was on the assumption that all the expenditure of the past year was upon repairs, and nothing was placed to renewals. His experience was chiefly in England, where, for general purposes, among engineers there was an estimated annual charge for renewals and depreciation of about 5d. to 5½d. He believed that wages were lower in Scotland than in England. In so far as they were lower, this would lead to a reduction of the average charge in Scotland.

Mr. ASHER: It would be dealing somewhat hardly with new works to take an average and apply that for depreciation?

Witness: No. Perhaps you will allow me to explain how I arrived at this. The sum expended by the Company has been entirely on repairs for the year. Apart from that, whether you start with new works or old, you must set aside 1½ per cent. of the original value for renewals; and this I have done. Everyone will agree that the actual expense for a particular year may vary from that of another year.

And that accordingly, for general purposes, you require to take something more than the accidental expenditure of a particular year?—Yes; but I have added nothing on that account.

But you seem to have started with the actual expenditure for this year, in the books?—The structural value at the present time.

But I am speaking of repairs and depreciation alone. How much is given off revenue for that?—1½ per cent. on the actual value of the works.

In the Stourbridge case, you were asked: "Taking the authorized standard dividends, which we know to be £3450, what do you capitalize them at?" You answered: "At 31 years' purchase; and I do so including the surplus plant. Were we to take the lower figure, I should feel myself entitled to claim for surplus plant." Do you know how much of your 31 years was applicable to surplus plant there?—I am not quite sure of the figure; but I think 2½ to 3 years—about

£9000. About 28½ years. I reached this amount with reference to the value of money—first-class securities—at that date (1893).

You were further asked: "Keeping in mind the principle, which I think is agreed, that the shareholders are to be compensated, income for income, in security of actual value, what do you think, with reference to the price of securities of undoubted stability now, with the new price of money?" You answered: "The price of money, as compared with twenty years ago, has fallen considerably. In 1871, the average price of Consols was £3 4s. 8d. per cent.; in 1891, it was £2 17s. 7½d.; while to-day, it is only £2 16s. 1d.—the difference in 21 years being 8s. 6½d., or 13s. 2d. per cent. If the 2½ per cent. Consols at £97 were taken, they would yield only £2 11s. 6d. per cent., which is a difference of 20·3 per cent. in 21 years." It was on this basis that you fixed your 31 years?—28½ years.

Have you considered the change in the price of Consols and other first-class securities between the time you gave your evidence and now?—Yes; I think they have risen about 10 per cent.

Assuming that the price of Consols to-day is £2, against £2 16s. 1d. when you gave your evidence in 1893, that would involve a fall of 28 per cent. since then?—I suppose it would.

And if this were so, securities of that class have appreciated since then to the extent of 28 per cent.?—Consols stand alone.

Do you not know that most other first-class securities have done the same, and, in particular, gas stocks?—They have all appreciated.

So that, if you were to compare them closely, probably the appreciation of gas shares is even more than the appreciation of Consols. But taking Consols as a fair standard, adding 28 per cent. to 31 years would work out at 39·68 years?—Yes; but I should not take Consols alone; that would not be fair.

Assuming there is no greater appreciation of Consols than of other first-class securities, it would be necessary to alter the number of years' purchase of your valuation?—If everything went up 28 per cent., probably.

My opinion is that you stood alone upon Consols at Stourbridge?—No; I stood upon the general rise of first-class securities. I gave several other instances besides Consols—railway stock, Birmingham securities, and others. I quoted 2 per cent. Consols at £97 in 1893. They are now standing at £105 or £106, which confirms my figure of about 10 per cent.

How much would that put upon your valuation?—Two or three years.

In any view your figure of 28½ years would have to go up?—I should have to admit 10 per cent. That would involve a rise of two or three years.

This would, in short, take the place of the allowance you make for the surplus at Stourbridge, and make the years you gave there 31?—Yes; you may take it at that.

Why do you allow only 22½ years (a difference of 9 years) when you come to Dunfermline?—My valuation of 28½ years at Stourbridge was taken on account of the conditions which surrounded the Company. They were paying dividends under their sliding-scale in excess of the standard dividend; and therefore I consider they were entitled to a higher rate than 25 years' purchase, owing to the greater stability of the standard dividend. They were precluded from claiming the full dividend they were earning; they had to be purchased on the basis of the standard dividend.

By Mr. FOULIS: It was a statutory company, under a sliding-scale, paying 10½ or 11 per cent.

By Mr. JONES: But there was a probability of their going up considerably on the sliding-scale.

Cross-examination continued: He did not think the profit in this instance was so perfectly secure as in the Stourbridge case. If there were no competition, he presumed the works would yield it, if the price were kept up. The prejudice which a Scotch company was under through not working under statute, was that they could not break up streets without permission of the local authority; and they were open to competition. At present, he did not think there was much difference between a stautory and a non-statutory company. The security from competition was, in his opinion, worth 6½ years' purchase.

Mr. ASHER: Do you know any case in Scotland where an existing gas company has been run out of the field by a competing company?

Witness: I know of one or two instances in which competition ensued.

Which resulted in amalgamation?—It resulted in serious loss to both companies until they amalgamated. I am referring to Scotland. Witness went on to say that the retort production in his works was about 6000 cubic feet per mouthpiece. The production in Dunfermline last winter, according to the carbonizing book, was 7200 to 7500 cubic feet per mouthpiece. This was considerably more than he was accustomed to. He quite agreed that the present value of the surplus works should be ascertained and added.

If you agree that the proper principle of valuation is to find out the maintainable profit, and multiply it by a certain number of years, what has the actual state of the capital account in the books to do with the valuation?—It has to do with it in this way, that over and above the obligation to reduce the price of gas, there is this obligation on the part of the Company to reduce their capital to the capital value of the works and plant.

What obligation?—Well, the Company should keep their books right; there should not be a fictitious value.

If they have a good income, with which they are satisfied, and a dividend with which they are satisfied, how does the actual book entry of capital affect it?—It is incumbent on all companies to keep their books orderly.

Suppose there has been injudicious expenditure in the capital account, that will not affect the value of the works, estimated according to the annual revenue?—I have taken that into consideration in estimating the assets—whether it be judicious or injudicious.

But if the proper mode of valuation is revenue, correct revenue, and if you are satisfied that it is maintainable, why should the value of the works come down because the book entry of the capital is smaller?—Although it is maintainable profit, it is saddled with that obligation.

Is it not quite common for gas companies to write up capital when they build new works, without deducting it, or paying it out of the reserve?—No, decidedly not. The Gaslight and Coke Company built new works and charged the cost to capital.

They just added on to capital the price of their new works, merely deducting what they got for the old?—I do not know that.

Mr. FOULIS: Nor can you tell how much they depreciated in previous years?

Witness: Certainly not.

Mr. ASHER: The Dunfermline Company at one time wrote up their capital from £17 to £25. Suppose last year they had written it down from £25 to £17, how would that have affected the business, as ascertained by maintainable revenue?

Witness: They would have had a smaller capital to pay interest upon.

Is that not mixing up two things that will not mix?—Well, I do not know that it is.

What has that dividend to do with the value of the works?—It certainly has to do with the maintainable profit, and with their power to reduce the price of gas.

Suppose they only divide as dividend a third of their profit, how does that increase the value of their works?—It will not increase it.

And if they overpay dividend, how does that diminish the value?—They are overpaying dividends at the expense of the consumers.

Is your mind not more familiar with statutory companies which are restrained in regard to capital and with regard to dividend?—Of course, statutory companies are regulated with regard to dividend; I do not know that that is the kind of gas business with which I am most familiar. The works will be sufficient for 30 years, at the present rate of increase—that is, taking the rate of increase for the last nine years. Taking the increase for the last two years, they will not be sufficient for very long.

Do you think it reasonable, considering the prospects of business, to include the years when the Company were in the old works?—Certainly it is not reasonable; but it is always done.

Assuming it to be the fact that the old works were almost in danger in giving the quantity of gas which they did, do you think it reasonable to take in any period when they were subject to that disability in considering the prospective increase now, when they have new works and ample producing power?—I should not be prepared to take last year as the basis. I should be surprised if the increase of 7 per cent. were maintained.

Mr. JONES: Do you know enough about Scotland to be able to say whether all mains of less than 3 inches diameter are being removed by gas companies?—I do not know that.

Do you not know exactly the contrary?—No; I do not. No reason occurs to me why the smallness of a main should not be a disadvantage in Scotland, as it is in England. I do not think the higher quality of Scotch gas makes a smaller pipe sufficient. The gas which I make is 17 candles. I do not think the illuminating power has anything to do with the size of main required. Witness added that if the percentage of unaccounted-for gas was small as compared with other towns in Scotland, it would indicate that the mains were fairly good. He said it would be a prudent thing to tear up all mains of 2 inches in diameter and less—that was all he had gone to. He did not know of any Scotch works of the same size as Dunfermline where the boiler, exhauster, and engine were in duplicate; but he should be very much surprised if they were not generally so.

I see that when this matter was discussed in Dunfermline, among the purchasers, the impression seemed to be that the price would have to be from £80,000 to £130,000. Do you seriously suggest that these works are only worth £40,000?—I seriously suggest that the works are worth £70,000, saddled with the liability for £17,000. The creditors on the £17,000 are, I should say, the consumers, out of whose pockets it was derived in former years. I am advised that this is not a compulsory sale. In the Stourbridge case, I proceeded on my own view of what a compulsory sale was worth.

Re-examined by Mr. SHAW: Take the case on the footing that it was an absolute certainty that if the Company did not sell after the town had adopted the Burghs Gas Supply Act, the town would be in a position to erect works in competition, and that in that case it would be impossible for the Company to compete on anything like equal terms, do you think this a most serious risk?

Witness: I certainly do.

Do you think that, in view of this position, which the Company acknowledge they stand in, it was to the interest of the Company (for their own stability, apart from the consumers altogether) to reduce the price of gas?—Certainly.

Mr. *R. Cockburn Millar*, recalled, put in a statement regarding the illuminating power of the gas supplied by the Edinburgh and Leith Gas Commissioners, and also regarding the discounts, which he found to be about ½d. per 1000 cubic feet. The figures in his statement he had ascertained personally from the books of the Commissioners.

The Pneumatic Painting Machine Corporation, Limited, were awarded a diploma for a gold medal for their appliances as shown at the recent Horse and Horseless Carriage Exhibition.

Extension of the Burnham Water-Works.—The Burnham, Dorney, and Hitcham Water Company, which has been in existence some four years, has succeeded so well as to be able to pay a dividend of 7½ per cent., and the shares have sold at a premium of 12½ per cent. The Company are now about to have works constructed at Littleworth Common, at a cost of about £3000, so as to be able to extend their service to Farnham Royal.

Frimley and Farnborough Water Company.—The Frimley and Farnborough District Water Company in their report state that, since the supply was commenced in March, the works have progressed very satisfactorily. At present they comprise a clear water reservoir, near Frimley Green, capable of containing 302,681 gallons; and a pumping-engine of the Worthington type equal to lifting 17,594 gallons per hour to the service reservoir at Frith Hill, which has a holding capacity of 384,025 gallons. About 18 miles of mains have been laid; and the number of houses now connected is returned at 189, producing an annual rental of £600. It is proposed to issue £9000 of additional stock to further extend the mains.

ELECTRIC LIGHTING NOTES.

By an extraordinary coincidence, the uncertainty and danger of the electric light were strikingly exemplified last Thursday evening. During the performance of the second act of "The White Silk Dress" at the Prince of Wales's Theatre, Coventry Street, Haymarket, an alarming incident occurred. About half-past ten o'clock, it was noticed that something was wrong with the electric lights; and those who were behind the scenes on the "prompt" side discovered that flames were running up from the switch board, and the electric lights all over the theatre were extinguished. The curtain was instantly lowered; and the Manager, stepping in front, hastily, but in cool and deliberate manner, stated that some slight mishap had occurred to the electric lighting arrangements, but that everything would be all right in a minute or two. Meanwhile active measures had been taken behind the scenes to deal with the mischief. The firemen in charge had got one of the private hydrants into play; and in a very short time the fire was extinguished. The flames had commenced to burn the woodwork, and had completely destroyed most of the wires; but they were not allowed to extend further. With little delay, the piece was proceeded with; the gas and some available electric light being utilized. The audience were entirely ignorant of the fact that within a dozen feet of the proscenium a dangerous fire, close to highly inflammable material, had broken out. The second mishap occurred in the City. Just at the time when thousands of people were hurrying homewards, the electric lights on Ludgate Hill, in St. Paul's Churchyard, Cheapside, Cannon Street, and Old Broad Street, suddenly went out. Fortunately, in many places gas was still burning; and those shopkeepers who had not banished it from their premises were able to congratulate themselves on their immunity from the dangers which threatened their neighbours in the unexpected advent of darkness. After the darkness had prevailed for about three-quarters of an hour, the light suddenly returned. It appears that the cause of the failure was a breakdown in the engine-room at the Southwark Bridge Central Station.

Some astounding statements were made by Mr. Cox, the Chairman of the St. Pancras Electric Lighting Committee, at last Wednesday's Vestry meeting. His Committee had reported that they "have still under consideration the means to be adopted for preventing any further interruption of the supply; but, while fully agreed on certain works that should be carried out before reporting to the Vestry, they are considering the question of applying the proposed method to be adopted in regard to the present street-lamps to the extension of the public lighting sanctioned by the Vestry on the 22nd of July last." This is all delightfully vague; but not so Mr. Cox's speech thereon. He said that his Committee, feeling that they had a great responsibility upon them, had devoted a long time to inquiring into the breakdown of the lighting on the 29th of August, the cause thereof, and the prevention of any future occurrence of a similar character. They had come to the conclusion that the high-tension mains would require reconstruction, and that the low-tension mains were in need of strengthening. The details of the scheme would be laid before the Vestry at the next meeting; but he might inform the members now that an outlay of some thousands of pounds would be required to put things in proper order. The mains had been laid too near the surface, their jointing was in many instances defective, and they had been affected by percolation. A large sum was spent in watching, testing, and repairing the arc mains—in fact, £900 might be set down as the annual expense on this account, when, under proper conditions, £40 or £50 should be sufficient. The pipes were at present too small; and as each contained five or six cables, it was frequently the case that when one cable was repaired the necessary operations caused injury to the others. He favoured the substitution of Doulton ware for iron pipes; and he should also propose that, instead of all the arc lights being on the high tension, they should be equally divided between high and low. Mr. Lazarus wished to commend Mr. Cox on the straightforward manner in which he told the Vestry that the parish would shortly have to lay out a large sum in reconstructing and strengthening the mains. He (Mr. Lazarus) had opposed the introduction of electric lighting into St. Pancras from the first; and he was now in no way surprised to hear what Mr. Cox had stated that afternoon. Before the Vestry had time to digest this naive confession of bad management, another bagatelle of £550 was asked for. This was for new plant for purifying and heating the feed-water of the boilers—an expenditure strongly recommended by Mr. Baynes, the Chief Electrical Engineer, in a long report, as a means of decreasing the heavy amount now spent for boiler repairs. A new furnace will cost £58 10s.; a mechanical damper, £25; and grease extractors, feed-water heaters, &c., £470. All these amounts were agreed to by the Vestry, who were doubtless influenced by the following clause in the report: "It will be obvious to members of the Committee that, unless this station is provided with efficient means of obtaining the full value from the coal, it is manifestly unfair to institute a comparison between it and more modern stations, fitted with every up-to-date appliance." More modern stations, forsooth! Is the St. Pancras Vestry's plant already obsolete? It would, indeed, appear so.

The Tonbridge District Council are about to make application for a Provisional Order to enable them to put down electric lighting works. They have come to this conclusion upon a report by Mr. Medhurst, who has drawn up a scheme involving a capital outlay of £10,300. He estimates at least 2000 lamps of 16-candle power will be in use at the expiration of the first year's working. The estimated income from 2000 lamps at 6d. per unit would, he calculates, be about £1800 a year; and the working expenses would not be more than £1100 per annum. To this must be added £566 10s. for the repayment of loans. He advises that the street gas-lamps in the compulsory area be supplanted by incandescent electric lamps of various candle powers. The capital outlay to secure this would be £700; and the present annual cost of gas lighting in the area is £193 5s. 3d. He further recommends the replacement of the existing steam and gas engines at the sewage works by electric motors, by doing which he estimates that a saving of at least £200 a year in working expenses would be secured.

The Hartlepool Town Council have discussed a recommendation of the Lighting Committee that a Provisional Order be obtained for empowering them to undertake the electric lighting of the borough. They have, however, agreed to defer the matter until next year.

The Manchester City Council had before them last Wednesday the question of the supply of electricity to the out-townships. The matter had been before the Gas and Electricity Committee, who had resolved as follows: "That the Gas Committee, under the advice of the Town Clerk, do take all requisite steps for the protection of the Corporation interests in regard to the supply of electric current to the out-townships; that, as recommended by the Electric Light Sub-Committee, a clause or clauses be inserted in the omnibus Bill about to be applied for by the Corporation of Manchester to enable the Corporation to supply electricity beyond the limits of the city, by agreement with adjoining local authorities, and, further, to extend the powers of the Corporation in reference to the supply of electricity; that inasmuch as several applications to the Board of Trade for Provisional Orders for the supply of electricity are likely to be made in respect of districts adjoining the city, and having regard to the fact that the Gas Committee of the Manchester Corporation, by sanction of Parliament, have been for many years supplying these districts with gas, and have considerable property there in the shape of street-mains, &c., this Committee are of opinion that they are bound to enter opposition to these applications, and hereby ask the approval of the City Council for taking that course; further, the Gas Committee, having reason to believe that several local authorities are willing to make arrangements with this Corporation to supply them with electricity in their districts, it is desirable that the Gas Committee be authorized and empowered to make and conclude under the corporate seal such arrangements with the local authorities with regard to such supply as in the judgment of the Gas Committee may be desirable." In presenting the minutes of the Committee, the Chairman (Mr. Gibson) remarked that the foregoing resolution seemed rather a "large order;" but, so that there might be no misapprehension, he should explain that all it was proposed to do was to supply electricity to the out-districts on the same terms as to the citizens. As the Council were aware, they had already power to supply the whole city with electricity; and, as a matter of fact, the current was taken to the boundaries of Stretford, Moss Side, and Withington. In order to supply these districts effectively, there was no doubt they would be compelled to put down plant somewhere near the borders of the district; and if, by an extra expenditure of (say) 25 per cent., they could get 50 per cent. more business, it would be well to do so, and thus be in a position to supply the out-townships at a profit to themselves and at a cheaper rate than the out-townships could do it for themselves. It was only desired to do this with the approval of the out-townships. The minutes were passed.

The Electric Lighting Committee of the Dublin Corporation have lately issued a report on the results of the working for the year 1895. They state therein that the gross income was £11,073, and the expenditure charged against it £7939; leaving a surplus of £3134. This surplus has been carried to the net revenue account; and after providing for £1679, interest at 3½ per cent. on the capital, for £500 transferred to depreciation account, and for amounts written off assets shown in the previous account, there is left a sum of £874 available towards meeting the charge of £2213 for the repayment of loans, the balance of which—viz., £1339—has been discharged through the rates account. The debit balance brought from 1894 being £1615, the total debit against the net revenue account is £2954. The latter sum has been provided for out of the rates assessed in 1891 and 1892; the balance to the credit of the rates account on Dec. 31, 1895, being £1805. On that date, the sum of £1000 charged against the net revenue account stood to credit in the depreciation account, having been invested in 2¾ per cent. Consols. The capital account shows that the total amount received on account of loans up to Dec. 31, 1895, has been £52,000; the expenditure on capital account to the same date being £53,164. The amount not yet taken up on account of loans which have been sanctioned by the Municipal Council and by the Local Government Board is £9400; and the amount remaining due on Dec. 31, 1895, on account of the £52,000 received, was £46,320. The Electric Lighting Committee look to the future with confidence. They say there are increasing demands for electric lighting from the citizens; and they are confident that, when they are able to establish an enlarged electrical power station (the present one being altogether too small to meet the increased public demand for electric lighting), they will be able to supply a magnificent installation for the public lighting of the entire city, as well as for a large number of private consumers.

Verity's, Limited.—Under this title, a Company has been registered with a capital of £140,000, divided into 7000 5 per cent. cumulative preference and 6980 ordinary £10 shares, and 200 management shares of £1 each, to adopt and carry into effect an agreement expressed to be made with J. B. Verity, G. H. Verity, and H. S. Verity, for the acquisition, by purchase or otherwise, as a going concern, of the businesses now and hitherto carried on in London, Manchester, and Birmingham under the styles respectively of B. Verity and Sons, Verity Brothers, and Verity's. No shares will be offered to the public. It is stated that the firm has been converted into a private limited company with a view to interesting certain of the managers, and ultimately of others engaged in the active working of the businesses. The firm has had an interesting history. It was established in the early part of the century by Mr. B. Verity, the grandfather of the present owners; and, though some of the earlier ledgers and books were destroyed in 1851, wages books and ledgers dating from 1837 are still in existence. In these many accounts with leading English families can be traced through three and four generations. In the early days, many small gas-works and gas-making apparatus were erected by the firm, who also fitted gas-pipes throughout Blenheim Palace in the fifties. On the death of the founder in 1861, the business was partially divided, and the firm of Messrs. Verity Bros. started by two of his sons. This business, however, was again absorbed by Mr. John Verity on their deaths; and the new Company thus take over these two old-established concerns, with the more recently founded businesses of Verity's carried on by the firm in Birmingham and Manchester.

METROPOLIS WATER SUPPLY.

The London County Council and the Examination of Water.

At the Meeting of the London County Council last Tuesday—Sir A. ARNOLD in the chair—the Water Committee reported that their attention had been called to the desirability of continuing the examination of the water supplied by the London Water Companies by the micro-filter method devised by the Council's Chemist (Mr. W. J. Dibdin, F.I.C., F.C.S.) last year. The Chemist, whom they had consulted on the matter, pointed out that the Companies' Chemists reported that there were no suspended matters in the London filtered water; and the Official Analyst, Dr. Frankland, did not refer to them in any way. On the other hand, the Chemists who had made investigations for the Council had definitely supported the results obtained by the Council's Chemist, in which he had been able to show that suspended matters were present in greater or less quantities, and that they were capable of being collected, weighed, and analyzed when a sufficient quantity of water was taken. But by the exceedingly delicate method of micro-filtration devised by the Chemist, the relative quantities and qualities were clearly differentiated, even in small volumes of water. The Chemist had submitted to the Committee estimates of the cost of examining the water supply of each Company. For an examination of the water three times weekly, making 24 samples a week, the cost would be £10; and for a daily examination, making 48 samples a week, £14 10s. The Chemist advised that the examination, although not chemically complete, would afford reliable data for indicating the variation in the efficiency of the filtration, and would be of extreme value in view of future inquiries. The Committee concurred in this opinion, but thought it would be sufficient to make three examinations weekly. They recommended—"That the Chemist be instructed to make three examinations weekly of the water supply of each Company, for a period of six months, at a cost of £10 a week, or £260 in all."

Mr. DICKINSON (the Chairman of the Committee) moved the adoption of the report.

Lord MOUNTMORRES said he considered £10 a week an exorbitant sum to spend on this work.

Mr. DICKINSON did not think so, in view of the fact that the samples would be taken from all over London.

Mr. BEACHCROFT thought the Committee's report one which was likely to cause alarm to the Water Companies. It was calculated that 11,000 tons of "wet mud" passed through the water-pipes of London every year; and what the Council desired to know was whether or not this "mud" was dangerous to health. The Council should know whether, as a result of the Chemist's investigations, the Water Companies looked better after their filter-beds.

Dr. LONGSTAFF said the Council were indebted to their Chemist for his new device for water analysis. In future, by its adoption, they were likely to get better results than had been the case in the past; for hitherto it had not been possible to show the amount of suspended matter in water.

Colonel FORD wished to know whether it was a fact that the Water Companies' Chemists had questioned the accuracy of the investigations of the Council's Chemist.

Mr. DICKINSON said the point was that, since Mr. Dibdin began his investigations, there had been a considerable improvement in the condition of the water supplied to London.

Dr. COLLINS said he understood also that the Companies denied the existence of suspended matter in their supplies.

Mr. J. S. FLETCHER was of opinion that the proposal entailed an extravagant expenditure of the ratepayers' money. If the Chemist had made a valuable discovery in reference to the analysis of water, the wisest course was that he should be placed in friendly communication with Dr. Frankland, the Official Analyst. It was idle to spend money on a second analysis, after one had already been made by one of the greatest experts on the matter. On these grounds, he moved, as an amendment, that the matter be referred back to the Committee for further consideration.

Mr. A. L. LEON seconded the amendment.

Mr. DICKINSON said the tests of the water by the officials of the Companies and the Local Government Board had not taken the direction of an examination of the suspended matters. Dr. Frankland's analyses by no means covered the whole subject. The investigation now made by the Council's Chemist showed that there was a remarkable amount of suspended matter in London water. This clearly proved that the filters used by the Companies at present were not able to stop this. He attributed a great deal of the improvement in the water which had taken place during the past few years to the systematic examinations undertaken of it by the Council's Chemist, and the reports made on these examinations.

Major PROBYN supported the recommendation, on the ground that, if the Council spent £3000 in testing gas, an expenditure of £260 for a half-year's examination of such an important article of general use as water was certainly not too much for the Council to sanction.

Sir J. LUBBOCK, M.P., characterized the proposal as a waste of the ratepayers' money. He said he could not see any reason why they should spend the public funds in examining water which had already been carefully analyzed by Dr. Frankland, who was one of the highest authorities, and one on whom they were entitled to rely.

Mr. DICKINSON, in closing the discussion, said that when the Council had before them the all-important question of what was to be the future water of London, it was doubly urgent that they should not lose any opportunity of inquiring into the system of filtration adopted. He wished it to be quite understood that he made no reflection on Dr. Frankland; but he might point out that the investigations made by him and the Water Companies' Examiners were not by any means complete, and therefore he hoped the Council would permit their Chemist to carry on investigations of his own. He proposed, for the purposes of his examinations, to take samples of the water from all parts of London.

On a show of hands, the amendment was negatived by a large majority; and the recommendation of the Committee was agreed to.

Dr. Frankland on the Quality of London Water.

The "scare" produced by the proceedings reported above led to Dr. Frankland being interviewed by a representative of one of the London morning papers. The Doctor opened his mind freely on the subject of the analyses of London water which have been made for the County Council by Dr. Klein, Dr. Dupré, and Dr. Stevenson. He contended that the samples dealt with by them had been improperly collected, inasmuch as they were taken from the stand-pipes—*i.e.*, the mains—at the filter-beds, and that consequently they had made their reports on what had happened between the filtration and the delivery of the water. In other words, they had taken their data from what might be called the "end of the cultivation of the microbe." He explained that 50 microbes in the water at the start from the filter might become 5000 at the end, so prodigious was their fecundity. Asked his candid opinion about the water supply of London, especially in regard to microbes, Dr. Frankland said: "There is no water supply in the world which is freer from microbes. There is no better system of filtration in existence than that carried out by the London Water Companies—sand at the top and gravel at the bottom. I venture to say that no pathogenic disease has resulted from microbes found in London water during the last twenty years, although the microbes have been carefully sought for. The point upon which I stand is that there is no better water supply in the world than that of London. I have heard that thousands of tons of mud are swallowed by people every year. But there is no water supply in the world which does not contain what these chemists call 'mud.' But as against that, it has been reported to the Local Government Board that this water, containing mud, is perfectly clear and transparent." Questioned as to the statement that the Southwark and Vauxhall Company had purveyed 51,040 bacteria per cubic centimetre, Dr. Frankland had only to say that it was ridiculous. "All these statements," he continued, "will be demolished; but we shall take our time in doing it. It is attempted to make the people of London believe that in drinking water they are drinking poison. There is nothing more convincing against this idea than the fact that since 1866—the year of the last cholera outbreak—the health of the Metropolis has exceeded that of any other capital in the world."

The Future Control of the Water Undertakings.

Last Wednesday evening, a mass meeting was held at the Eastern Empire Music Hall, Bow Road, E., to press for early legislation on the question of the water supply of London. The meeting was held under the auspices of the Conservative and Unionist Associations for the Tower Hamlets, Hackney, West Ham, and Bethnal Green, and of the London Municipal Society. There was a crowded attendance. The chair was taken by the Hon. L. HOLLAND, M.P.

The CHAIRMAN, in opening the proceedings, said the vast assemblage before him showed that the Unionist party in East London was in earnest in demanding from the Government a satisfactory solution of the water question during the coming session. In East London, they unfortunately had to bear the brunt and burden of the battle; and they had been a sort of object-lesson of the necessity of reform in the water supply of London. They had had experience of the inconvenience, the stress, the discomfort, and even the danger, which could not be wholly avoided so long as the provision of water to the Metropolis was in the hands of no less than eight private Companies. They were met to suggest a practical remedy for a very real evil, and not to advocate any mere empty theory or empty fad. They demanded that the supply of water should be equal and sufficient at all times and under all conditions in all districts of London. The supply must not only be uniform and of a high degree of purity, but the charge must be equal and moderate. This could only be secured by amalgamation, by purchasing the existing undertakings, and putting them under the control of a single authority; and it was to strengthen the hands of the Government in such a policy that they had met.

Lord ONSLOW said that, as one whose duty it was to watch over the municipal interests of the Metropolis, he had noted the grave situation at which the water problem of London had at last arrived. It might be that some accounts of the recent scarcity of water had been some what highly coloured; but it must be admitted that there had been a great deficiency in the supply. The cause of the scarcity was threefold. In the first place, it was owing to the exceptional drought; in the second, to the fact that the East London Water Company had but inadequate means of drawing upon other sources of supply; and in the third place, to insufficient storage capacity. The drought was a visitation of Providence; but every reasonable means ought to be taken to provide against such a contingency. In 1893, the East London Water Company introduced a Bill in Parliament for the purpose of increasing the extent of their storage. But it was rejected; and the consequence was what they all knew. In 1894, the Company applied for further powers; but the Radical Government then opposed them. He did not think any members of the Unionist party had ever said that they were opposed upon principle to vesting the undertakings of the eight Water Companies in one public authority. He was perfectly willing to favourably consider any proposals for doing this upon fair, right, proper, and reasonable terms; and in this matter he spoke not only for himself but for the Government, who were most anxious to settle the question upon equitable terms. Mr. Stuart had declined the overtures of the Government last session; and his action prevented a solution of the difficulty. Now the question was: What should be done in the future? All parties were agreed that the water supply must be placed in the hands of a representative authority; and three courses were open. They could leave things alone, establish some sort of control over the Companies, or purchase their undertakings. The first was out of the question; and he showed that control was impracticable. Purchase was the only possible remedy; and it was in accordance with precedent. The cost would not be nearly so great as some people imagined; and he hoped some practical steps would be taken in the direction suggested next session. The London County Council proposed to introduce other Purchase Bills. If the Council

were prepared to follow the precedents in this matter, and would consent to the arbitrators who were to value the undertakings taking into consideration all the circumstances on one side and the other, and making an award which should be perfectly fair between the people of London and the Water Companies, he for one should certainly not be found in opposition to them. As he had said, the Government were anxious to come to a final settlement of this question; and they could not do better than leave everything to their decision.

Mr. W. R. BOUSFIELD, M.P., then proposed the following resolution: "That, in view of the grave inconvenience during the last two summers to the inhabitants of that part of the Metropolis and its neighbourhood which the East London Water Company is empowered to supply with water, owing to the insufficient amount of water available for the district under the existing conditions of supply, and in view of the danger to health of, and intolerable discomfort to, the population which results from such failure of supply, this meeting, representative of the thirteen parliamentary divisions of the Tower Hamlets, Hackney, West Ham, and Bethnal Green, calls upon Her Majesty's Government during the next session of Parliament to constitute an authority for the water supply, representing the interests of the consumers, with powers of control and purchase."

Mr. E. GRAY, M.P., seconded the resolution, which was carried with only one dissentient.

It was resolved to forward copies of the resolution to Lord Salisbury and Mr. Balfour.

Conference of Parliamentary and Local Representatives.

A conference of members of Parliament and of the London County Council, and representatives of London local authorities, was held last Friday at the Hackney Town Hall, to consider the question of the London Water Supply. Mr. G. Chambers, the Chairman of the Hackney Vestry, presided, and explained that, as the meeting had been organized in Hackney, the representatives of that district had formulated a series of resolutions to be submitted to it. The first was as follows: "That this conference, consisting of the members of Parliament representing the Metropolis, members of the London County Council, and the representatives of the various Vestries and District Boards of the Metropolis, is of opinion that the supply of water for London should be in the hands of a popularly-elected body." It was moved by Mr. Whiter, and seconded by Mr. Robertson, M.P. Captain Caster (Poplar) thought that the meeting, which only represented ten Vestries and District Boards, was not strong enough to deal with the question. He proposed that the conference should be adjourned until all the local bodies in London could be represented. This was put to the vote and defeated; and the original resolution was carried. Mr. A. Smith proposed the second resolution: "That a Committee be appointed to consider what steps should be taken to endeavour to accomplish this end; such Committee to consist of the Metropolitan members of Parliament, twenty members of the London County Council, and three representatives from each Vestry and District Board, who have joined in this conference, with power to add to the Committee other representatives of local authorities who may wish to take part in the proceedings." Mr. Pickersgill, M.P., entered his protest against the resolution; remarking that, as the Committee was proposed to be constituted, the majority would consist of Unionist members of Parliament, who would be in opposition to the London County Council, and thus defeat the object the conference had in view. The resolution was, however, carried; and an Executive Committee was appointed.

SHEFFIELD CORPORATION WATER SCHEME.

Mr. E. M. Eaton's Position and Remuneration—Rejection of the Water Committee's Proposals.

Another long discussion took place in the Sheffield City Council last Wednesday, in continuation of the one reported last week (p. 807), on the question of Mr. Eaton's position and remuneration in connection with the new water scheme. It may be remembered that, on the previous occasion, the Chairman of the Water Committee (Alderman Gainsford) brought forward their amended proposals, which were shortly as follows: That Mr. Eaton would, for the same salary that he has at present, (1) design and superintend the construction of the new works in the Little Don Valley; and (2) be Consulting Engineer for the existing works, for distribution, and for the Damflask works. It was further proposed that he should have liberty to take outside work, subject to the claims of the Corporation upon the whole of his time for the efficient and full discharge of the duties described. To these proposals an amendment was moved by Mr. Fisher, to the effect that the Committee's proceedings relating to Mr. Eaton should not be confirmed, but that the Committee should be instructed to carry out the works by "the employment of a Resident Engineer of established reputation at a salary, such Resident Engineer to devote the whole of his time to the works; the Corporation to have power, in their discretion, in case of any special circumstances or difficulty, to be supported with a second engineering opinion at their own expense."

The debate was resumed by Mr. Roberts, who presented to the Council a vast array of facts in relation to other towns where waterworks had been constructed on the commission system; and the point of his argument was that this would be the right system for Sheffield to adopt. He said he was quite aware that the proposal of the Committee was to give Mr. Eaton a salary; but in his opinion—and he thought he was speaking that of the majority of the Committee—their second proposition was not as good and as practical as the first. They still adhered to the proposal of giving Mr. Eaton a commission—a limited commission, if they liked. They might pay him £14,000 or £15,000, make it so that he could not get more than a certain sum, and pay that sum in instalments during a period of years while the works were being constructed. To his mind, that would be the proper way of dealing with the matter. The majority of the Committee had given way, and agreed to recommend a salary, for the sake of peace; but it did not seem to have produced it. Personally, he should be very glad to see the present proposal altered back to a suggestion of a limited commission, to be paid during a number of years. Mr. Senior followed, and compared Mr. Fisher's amendment to "a ship without a rudder." He characterized the opposition to the Committee's proposals as all sentiment; and he urged the Council not to let this lead their judgment astray. Mr. Wilson said he was in favour of a resident engineer, with a chief consulting engineer. At the close of a very temperate speech, he asked if Mr. Eaton had not resigned. Alderman Gainsford explained that Mr. Eaton had placed in his hands a sealed envelope, telling him that it contained his resignation, as he wished the Council to have a free hand in considering him. The Committee determined that the Council should be untrammelled; and the letter had not been opened. Sir Henry Stephenson was the next speaker. He recalled to the memory of the Council the nature of the parliamentary bargain entered into with Barnsley, which will involve Sheffield in heavy pecuniary responsibility if that authority's reservoir is constructed first, with the view of enforcing the absolute necessity of not losing time in starting the new works. He said he believed that the plans prepared by Mr. Eaton for the sanction of Parliament should be carried out under his direction; and there was no ground for the feeling that Mr. Eaton had taken the Committee by surprise. Mr. C. F. Bennett, in the course of a long speech, criticized the Committee's recommendations, which he stigmatized as "extraordinary and unbusinesslike." He said he would obtain a thoroughly competent man to be the resident constructing engineer at a salary, say, of £1000 a year. But before taking a single step towards commencing the work, he would obtain the services of two of the most eminent engineers in the kingdom—Mr. Eaton might be one of them—and these, along with the constructing engineer, should formulate a scheme for carrying out the works. He would provide for the advice of a consulting engineer being obtained as often as required. Mr. Wardley suggested, amidst laughter, that the Committee should be disbanded and a fresh one appointed. He denied that Mr. Eaton was either a consulting or a constructive engineer, never having carried out a big undertaking; and he contended that the Council were being asked to set him up in business with a title to which he had no claim. Alderman Franklin, in a very able speech, appealed to the Council to defeat the amendment by which Mr. Fisher sought to make the Committee do as he wished, and to refer the subject to a different Committee in order to have it settled on some other lines. The Council, he said, would be perfectly safe in entrusting the work to Mr. Eaton on terms that could be arranged; and he believed that, if the question were placed before a town's meeting, the ratepayers would see through the sophistries of those who supported the amendment. After a brief review of the controversy, Alderman Clegg proposed that the Council should not confirm the minutes of the Committee, but that a Committee consisting of four gentlemen representing the majority of that Committee, four representing the minority, and five independent members of the Council (the Committee therefore consisting of thirteen members) should be appointed, for the purpose of trying to prepare adequate proposals embodying the appointment of a competent resident and consulting engineer. He said he thought this amendment would meet with the approval of the majority of the members of the Council; and he therefore hoped that, if Mr. Fisher would not withdraw his amendment, they would vote against it, in order to enable him (Alderman Clegg) to move what he submitted was a solution of the difficulty. The discussion was continued by Alderman Gainsford, Mr. Carr, and Alderman Skelton. The last-named gentleman appealed to Mr. Fisher to withdraw his amendment, and to Alderman Gainsford to take back the minutes of the Committee affecting the appointment of an engineer, so that the matter could be reconsidered. Alderman Gainsford asked Alderman Skelton if he meant them to support Alderman Clegg's amendment. Alderman Skelton replied that what he meant was that they should take the question back to the Committee altogether, consider it there, and bring up a scheme; and if the Committee could not formulate one which would at once be acceptable to the Council, then adopt Alderman Clegg's suggestion, and work it out another way. Alderman Gainsford expressed, on behalf of the Committee, his willingness to fall in with this proposal. Alderman Clegg said his amendment would provide for the Committee bringing up a report. They were to prepare and bring up adequate proposals embodying the principle of the appointment of competent resident and consulting engineers. Mr. Fisher intimated that he did not agree to the suggestion of Alderman Skelton. He would, however, vote for Alderman Clegg's amendment when his own had been dealt with. After some further discussion, a vote was taken, and the amendment was carried by a majority of twelve.

It was then stated that an amendment by Mr. Bennett had been received, which would take precedence of Alderman Clegg's. Thereupon the Town Clerk (Mr. H. Bramley) laid before the Council Mr. Eaton's resignation. He said Mr. Eaton had directed him to say that, if Mr. Fisher's amendment was carried, it should be handed in. Mr. Bennett then moved that the whole question of the construction of the new water-works should be referred back to the Water Committee, for them to bring forward a scheme which would not involve payment by commission, and would provide that the Engineer should devote his whole time to the work; reserving the right to employ such Consulting Engineers as the Corporation deemed fit. He said he thought it would be better for a unanimous scheme to come from the Water Committee than from such a Committee as that suggested by Alderman Clegg. Mr. Eaton favoured Mr. Bennett's amendment. He said that he had every confidence in the Water Committee as at present constituted; and he hoped the members would take back their scheme with the instruction, at all events, that a Resident Engineer was to be appointed. After some further discussion, this amendment was defeated by 28 votes to 20. Alderman Clegg then moved his amendment proposing that the whole question be referred to a Special Committee; and it was agreed to by a large majority. A motion next came before the Council for the adoption of the original minutes of the Water Committee, less so much of them as had been displaced by Alderman Clegg's amendment. A question here arose as to what had become of Mr. Fisher's amendment; and it was explained that it was confirmed by that of Alderman Clegg. The minutes were accordingly passed. Mr. Eaton's resignation was then ordered to be placed on the minutes and referred to the Committee. This brought the long discussion to a close.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

I am writing these "Notes" under the most perfect artificial light I have ever seen—an incandescent gas-burner with a "Holophane" globe. On my recommendation, a firm of gas-fitters procured and fitted up an arrangement of the kind; and when I saw it at work I was charmed with it. Now I have got it in my own house, I am more than ever delighted with it. The incandescent light, on account of its length, gives the best results in the "Holophane" globe, because of the large number of points illuminated. Another advantage of the globe is that it is clear glass, and does not absorb light as frosted glass does. The light radiates everywhere—it is, indeed, so diffused that there is scarcely any shadow. With one burner, I can now see to write in any corner of the room. The combination of the incandescent gas-burner with the "Holophane" globe is the bringing together of two of the most valuable discoveries in the production of artificial illumination which have ever been made; and the result is an ideal light. I am certain that everyone who sees the light will endorse my views.

The Edinburgh and Leith Gas Commissioners, at a meeting on Monday, received reports from the Engineers which showed that during the month of September there was an increased output of 9,740,000 cubic feet of gas, as compared with the same month of last year; and that since May 16 there had been an increase of 22,398,000 cubic feet, as compared with last year. The illuminating power of the gas was 25½ candles. Councillor Hunter, of Edinburgh, moved that a return be obtained of all inhabited houses in Edinburgh and Leith in which gas was not used. He said that the idea occurred to him that it would be desirable, in view of the loss which might be occasioned by the electric light, that they should seek new customers; but he was glad to know that, comparing the consumption of gas in September, 1894, with that in September, 1895, there was an increase in 1895 of nearly five million cubic feet; and that in September of this year there was an increase over the same month of last year of over nine million cubic feet. Still, he had no doubt that there were a large number of houses in which gas was not used; and they might get it into them by means of penny-in-the-slot meters. By this means they would increase their revenue. Lord Provost M'Donald said it was desirable to have such a return. The Clerk had told him that the Surveyors, as they had been going round reading the meters, had obtained the information, and that the return was almost ready. A letter from Mr. Beveridge, Parliamentary Solicitor to the Corporation of Edinburgh, was read, pointing out that in the Edinburgh Extension Bill there was scheduled the purchase by the Corporation of the Portobello Gas Company's undertaking; and suggesting that the sooner the Corporation and the Commissioners were agreed upon the course to be followed for the suppy of gas in Portobello, the better. The Clerk said he had learned that the Corporation of Edinburgh had appointed a Special Committee to consider the subject. Mr. John Jameson said the question had been started whether the Commissioners would require to promote a Bill themselves on the subject. The Lord Provost said there was no use for that. A Special Committee was appointed by the Commissioners, to meet with the Corporation Committee on the subject. A letter from the Clerk to the Dundee Corporation was read, stating that they had appointed a new Gas Engineer and Manager, and asking for information as to the salary and emoluments which the Commissioners paid to their Engineer and Manager. The Lord Provost said that "every herring should hang by its own head," and the conditions there might be very different from those in Dundee. Ultimately it was agreed that the Treasurer should send the official returns of the Commissioners to the Dundee Corporation.

Almost the only item of the business transacted which I would like to refer to is that of the acquisition of the Portobello Gas Company's business. The idea is that the Corporation of Edinburgh, which on and after to-morrow includes the burgh of Portobello, having acquired the undertaking of the Portobello Gas Company as from the 11th prox., should convey it to the Gas Commissioners at the same price as they pay for it. I would like to call attention to the remark of the Lord Provost, that there was no need for the Gas Commissioners promoting an Act of Parliament to give them power to enter into an agreement to this effect with the Corporation. I do not know who is the Lord Provost's adviser; but I have no hesitation in saying that the view his Lordship expressed is wrong. In the Edinburgh and Leith Corporation Gas Act of 1888, the area of supply is defined as "exclusive of the burgh of Portobello." Had the expression been "exclusive of the area supplied by the Portobello Gas-Light Company," there would be some reason in the Lord Provost's belief that no Act is required, because the Company having ceased to exist there could be no bar to the Commissioners stepping in to supply gas. The only way by which it can be said that there is no need for an Act is that the burgh of Portobello will have ceased to exist; but this reasoning would not be sound, because, in one sense, the burgh will be still in existence, having only changed its form. But whatever view be taken of the matter, there is no gainsaying this, that so long as the words remain in the Gas Commissioners' Act, if the Commissioners supply gas in Portobello, they will do so without statutory powers—a position which the Commissioners, I dare say, will scarcely like to occupy.

The Corporation of Port-Glasgow made their annual inspection of the town gas-works on Monday. The company were shown over the works by Mr. M'Cubbin, the Manager; and after an inspection of the new plant, luncheon was served. Bailie Macfarlane, Convener of the Gas Trust, alluded to the improvements effected during the last year or two; mentioning that these had involved an expenditure of upwards of £2500. He was satisfied that the money laid out would give a valuable return to gas consumers. On the motion of Provost Rodger, a vote of thanks was awarded Bailie Macfarlane for his services as Convener.

The new gas-works which have been acquired by the Corporation of Rothesay were formally opened yesterday. The site is adjacent to the public park in High Street; and was formerly occupied by the Broadcroft Spinning Mills, which have been closed for several years. The purchase price was £2500; and it is estimated that the construction and fitting up of the works will cost about £12,000. In May last year, the taking down of the old mills began; and in March last the building work was started. The retort-house and coal-stores are situated not far from the entrance gate. The roof is in three spans; the centre one being 58 feet wide, and the two side ones 21 feet each. The retort-bench, in the centre span, consists of six ovens of six retorts each, which are capable of producing 300,000 cubic feet of gas in 24 hours; but ample provision is made for increasing the production to 1,000,000 feet when necessary. The retorts are on the regenerative principle, with full control of primary and secondary air. The coal-stores hold over 2000 tons of coal, equal to about six months' supply. Behind the retort-house is the boiler and engine-house, in which there are two exhausters and horizontal engine to drive the pumps. The two boilers are of 50-horse power each, and are fitted with Meldrum's patent furnace for consuming the coke refuse. Opposite the engine-house are two sets of condensers, behind which are the washer and two tower scrubbers, 30 ft. high by 6 ft. 6 in. square; and adjacent are the lime-store and purifiers. The gasholder, 80 feet in diameter, is in two lifts of 20 feet each; and when full it will hold 186,000 cubic feet of gas. One of the present holders at the old works, capable of holding 72,000 cubic feet of gas, will be removed to the new works, so that the combined capacity of both holders will be over 250,000 cubic feet. The station-meter house and sulphate-house occupy a central position in the works. The meter-house contains all the latest improvements. The workmen are provided with a set of rooms; and the offices are situated in front of the retort-house. The Engineer of the works was Mr. Gillespie, of Glasgow. The opening ceremony consisted in the placing of a bottle, containing the customary articles, in a place prepared for its reception, by Provost Milloy, and the starting by him of the engine. The company were afterwards entertained to luncheon in the Royal Hotel; and then, in addition to the drinking of the usual toasts, Provost Milloy and Bailie Aitchison, the Convener of the Gas Committee, were each presented with a piece of plate, subscribed for by the Contractors.

A rather serious case of poisoning by gas occurred at Grangemouth to-day, in the house of Mr. J. Carnie, a pilot. In the morning three children who occupy one bedroom were found to be in an unconscious condition; and two of them have died during the day. The information to hand points to the fatality having occurred in connection with the use of a gas-stove. It is stated to have been the practice of the family to put out the gas-fire before retiring, and that last night this was neglected.

In the Bill Chamber of the Court of Session to-day, Lord Pearson had before him a knotty question which has arisen in connection with the public lighting of the village of Newcastleton, in the county of Roxburg. The village has, for some years, been lighted by oil-lamps; the cost being defrayed by voluntary contributions. In February of this year, the inhabitants took advantage of the Local Government Act of 1894 to form a special lighting district. In forming this, the curious arrangement was made that the whole of the parish of Castleton—extending to 17 miles one way, and from 5 to 10 miles across—was made the lighting district; while it is only intended to light the streets of the village of Newcastleton. The valuation of the village is £1370; and of the rest of the parish, £23,365. The inhabitants outside the village are discontented at the prospect of having to pay for lighting other people's property, at which I am not surprised, because it is a bad arrangement. They cannot now resist, for the district is formed; but the method they have adopted to put a spoke in the wheel of the Lighting Committee is somewhat ingenious. The lighting is to be in terms of the provisions contained in the Burgh Police (Scotland) Act of 1892, section 99 of which says that the light to be provided is to be "gas or other improved light." There are no gas-works in Newcastleton; and the Lighting Committee propose to utilize the oil-lamps which were formerly employed, and which they have received as a gift. The claim has been made, however, that oil consumed in such lamps is not an improved light; and the residents outside the village seek to have the Lighting Committee interdicted from using oil. The effect of this would be to put a stop to the lighting of the village except in the old way; and the complainers would thus escape assessment. The Committee say that the lamps they are to use are of the most modern construction; and that the light from them will be "an improved light." Lord Pearson passed the note for trial of the question as to whether oil can be spelt into the Act of Parliament; but in respect that the village would be thrown into darkness thereby, he refused to grant interim interdict.

The "Glasgow Herald" of Wednesday contained the following: "We understand that negotiations are on foot directed towards the formation of a powerful Coal Trust Combination in the West of Scotland. The aim is to amalgamate six or so of the largest producers of fuel in the district. The proposed capital will be £2,000,000—£1,000,000 of ordinary stock, £500,000 4½ per cent. debentures, and £500,000 5 per cent. preference shares. For various reasons we are not at liberty to give the names of the parties to the negotiations—which are not yet concluded—but those moving in the matter are confident that substantial benefits to all concerned would accrue from such a combination as is proposed, and which, unlike the recent English combination, is to be one of producers only."

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Oct.* 31.

Sulphate of Ammonia.—The week opened with larger inquiry, which has resulted in a considerable amount of business and some recovery in values; the closing quotations being £7 2s. 6d. Leith, £7 3s. 9d. Hull, and £7 3s. 9d. to £7 5s. f.o.b. Liverpool. The largest buying has been done in Scotland, which has for some time been the weakest market; and the improvement has been most pronounced in this quarter. The buying has been mainly for "covering" purposes; but the demoralized condition of the market has, for some weeks past, attracted the notice of consumers, who have come forward at the lowest prices touched, but who so far do not seem inclined to follow the advance. In the forward position, there has been buying by speculators to cover "bear" sales; but this has been difficult—makers being for the most part disinclined to sell ahead, unless up to the end of the year. Consumers, too, manifest more disposition to

buy for forward delivery—January-March or January-June especially; but, speculators having become somewhat alarmed by the firmer spot market, this is not now possible, unless at a stiff premium.

Nitrate of Soda remains quiet, at 7s. 10½d. per cwt. for good, and 8s. for refined quality.

LONDON, *Oct.* 31.

Tar Products.—The check given to benzols, as mentioned last week, still keeps the price below what has been touched; and business, both for prompt and forward, is by no means so firm as it was. Appearances, however, do not indicate that there is any immediate prospect of a further decline. Crude naphtha has scarcely fallen in proportion to benzol; as some speculative buyers continue to pay prices based on the higher rates realized for benzol. Pitch continues flat; and buyers are slow to take deliveries—delaying shipment in the hope of the present higher rates of freights collapsing to their old figure. Carbolic acid continues firm and in good demand at 1s. 9½d. to 1s. 10d. There is no new feature in anthracene.

Values are as follows: Tar, 18s. 6d. to 26s. 6d. Pitch, 28s. to 30s. Benzols, 90's, prompt, 4s. 3d.; forward, nominal, 4s.; 50's, prompt, 3s.; forward, nominal, 2s. 10d. Toluol, 2s. 2d. Solvent naphtha, 1s. 6d. Crude, 30 per cent., naphtha, 1s. 3d. Creosote, 2d.; liquid, 2⅛d. Heavy oils, 4½d. Naphthalene, 6£s. 6d.; salts, 32s. 6d. Cresylic acid, 9½d. Carbolic acid, 60's, 1s. 10d. Anthracene, "A quality," 10d.; "B," 8½d.

Sulphate of Ammonia appears to have got to rock bottom; and business has been more freely done at £7 to £7 5s. per ton, less 3½ per cent., with highest prices offered for forward delivery.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—During the past few weeks, the increased demand coming forward for all descriptions of round coal, has brought about some hardening in prices; quotations having here and there been put up about 6d. per ton, while generally there is a levelling up to list rates where these have previously been cut down to meet competition. A fair weight of business comes forward in steam coals; and it is now exceptional where best Wigan Arley is obtainable under 10s. 6d. per ton. Pemberton four feet and seconds Arley averages 9s. per ton; and steam and forge coals, 6s. 6d. Engine fuel is in good demand, so far as the better qualities are concerned, with higher prices obtainable on contracts for forward delivery; but common sorts show no improvement, and continue to be offered at low prices. In the shipping trade, there is a fairly active business stirring; and prices show a hardening tendency. It is now only in exceptional cases where steam coal can be bought under 7s. 3d. to 7s. 6d. per ton; while in some instances as much as 7s. 9d., or even more, has been obtained, delivered at the Mersey ports or the Manchester Ship Canal.

Northern Coal Trade.—There has been a decided improvement in the North-eastern coal trade in the last few days; and the shipments of coals have been enlarged considerably. The steam coal trade is the branch in which there is the greatest dulness; and for the best Northumbrian steam coals the quotation is nominally 7s. 9d. per ton f.o.b. Second-class steam coals are about 7s. 3d. per ton. In Durham coals the business is better; and the general tendency of the gas and household trades to enlarge at this season of the year is very marked, while the fact that a few of the Durham collieries have been laid idle tends to make the demand concentrate on the other pits. In the gas coal trade, there are very few contracts now being negotiated; but the deliveries on old contracts are increasing. For single cargoes of best Durham gas coals, the price varies from 6s. 9d. to 7s. per ton f.o.b.; but some of the best-known pits have the bulk of their output taken up, and are able to command a higher price. In gas coke, there are larger supplies; but there seems to be increased household use, and stocks are not increasing with any great rapidity. There is no change in price this week.

Scotch Coal Trade.—There is a large volume of business; but as yet prices do not move. It looks as if an advance in the near future is a certainty. The home consumption is very good; there being great activity in most of the industries requiring coal. It is the export trade which is the drag. The prices quoted are: Main, 6s. 3d. per ton f.o.b. Glasgow; ell, 6s. 9d. to 7s.; and steam, 7s. 9d. The shipments for the week amounted to 171,834 tons—an increase over the preceding week of 21,368 tons, but a decrease on the corresponding week of last year of 8927 tons. For the year to date, the total shipments have amounted to 6,346,461 tons—an increase on the same period last year of 230,113 tons.

Monte Video Gas Company, Limited.—The Directors of this Company have declared an interim dividend of 2½ per cent. for the half year ended June 30.

Lambeth Water Company.—The Directors of this Company have decided, subject to audit, to transfer £2250 to the contingency fund, and to recommend the payment of a dividend at the rate of 9½ per cent. per annum on the 10 per cent. shares, and at the maximum rate on the 7½ per cent. shares for the past half year; leaving a balance of £5116 to be carried forward.

Eastbourne Water Supply.—In connection with the difficulties which have arisen with regard to the water supply of Eastbourne, as reported from time to time in the "JOURNAL," the opinions of Mr. A. Macmorran, Q.C., and Mr. W. Graham have been obtained, on behalf of the Town Council, as to the position of the ratepayers who have bought water from other sources than those owned by the Eastbourne Water Company, owing to the alleged contamination of the Company's supply. The joint opinion is to the effect that the inhabitants are entitled to recover the amounts expended by them in purchasing a supply of pure and wholesome water, and also the cost of carrying it from the Holywell stand-pipes; but that the Company can claim their rates so long as they supplied water. The Eastbourne Town Council have resolved, in view of the repeated refusals of the Company to receive the deputations appointed by the Council, or to discuss any amicable arrangements, not to approach the Company again, but to proceed with their Water Bill.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST (see ante, p. 840).

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	15 Oct.	10½	Alliance & Dublin 10 p. c.	22–24	..	4 7 6
100,000	10	"	7½	Do. 7 p. c.	17½–18½	..	4 1 1
300,000	100	1 July	5	Australian (Sydney) 5% Deb.	108–110	..	4 10 11
200,000	10	29 Oct.	5	Belgrano (B. Ayres), Limited	10–10¼*	..	4 15 3
100,000	Stck.	26 June	5	Do. 5 p. c. Deb. Stk	100–103	..	4 17 1
200,000	5	29 May	6½	Bombay, Limited	7⅝–8¼	..	3 18 9
40,000	5	"	6¼	Do. New, £4 paid	5¼–6	..	4 6 8
380,000	Stck.	13 Aug.	12	Brentford Consolidated	285–290	..	4 2 9
210,000	"	"	9	Do. New	215–220	..	4 1 9
50,000	"	"	5	Do. 5 p. c. Pref.	140–145	..	3 9 0
159,375	"	12 June	4	Do. 4 p. c. Deb. Stock.	130–134	..	2 19 9
220,000	Stck.	16 Sept.	11½	Brighton & Hove Original	242–247	..	4 13 1
208,820	"	"	8½	Do. A Ord. Stk.	185–190	..	4 9 5
933,500	Stck.	28 Aug.	5	Bristol, 5 p.c. max.	127–132	..	3 15 9
420,000	20	15 Oct.	11¼	British	56–57	–½	3 18 11
50,000	10	28 Aug.	11¼	Bromley, Ordinary 10 p. c.	22–23	..	5 0 0
71,000	10	"	8½	Do. 7 p. c.	19–20	..	4 5 0
500,000	10	15 Oct.	6	Buenos Ayres (New) Limited	10½–11	+¼	5 9 1
200,000	100	1 July	6	Do. 6 p. c. Deb.	103–106	..	5 13 2
150,000	20	15 July	8¼	Cagliari, Limited	29–31	..	5 6 5
100,000	10	30 Sept.	6	Cape Town & District, Ltd.	17–18	..	3 6 8
50,000	50	2 May	6	Do. 6 p. c. 1st Mort.	58–60	..	5 0 0
550,000	Stck.	15 Oct.	13½	Commercial Old Stock	341–346	..	3 18 0
165,000	"	"	10½	Do. New do.	255–260	..	4 0 9
165,000	"	12 June	4½	Do. 4½ p. c. Deb. do.	152–157	..	2 17 3
800,000	Stck.	12 June	13	Continental Union, Limited.	278–283	–5	4 11 0
200,000	"	"	10	Do. 7 p. c. Pref.	220–225	..	4 8 11
51,600	Stck.	28 Aug.	14	Croydon Com'cial A 10 p. c.	315–320	..	4 7 6
163,400	"	"	11	Do. B 7 p. c.	250–255	..	4 6 3
535,000	Stck.	28 Aug.	5½	Crystal Palace Ord. 5 p. c. Stk	140–143	..	3 13 5
60,000	"	"	5	Do. 5 p. c. Pref.	140–145	..	3 9 0
486,090	10	15 July	11	European, Limited	26–27	–¼	4 1 6
354,060	10	"	11	Do. £7 10s. paid	18–19	..	4 6 11
5,746,590	Stck.	13 Aug	12¾	Gaslight & Coke, A, Ordinary	303–308	–2	4 2 9
100,000	"	"	4	Do. B, 4 p. c. max.	110–115	..	3 9 7
665,000	"	"	10	Do. C, D, & E, 10 p. c. Pf.	305–315	..	3 3 6
30,000	"	"	5	Do. F, 5 p. c. Prf.	147–152	..	3 5 9
60,000	"	"	7½	Do. G, 7½ p. c. do.	212–217	..	3 9 1
1,300,000	"	"	7	Do. H, 7 p. c. max.	207–212	..	3 6 0
463,000	"	"	10	Do. J, 10 p. c. Prf.	305–315	..	3 3 6
476,000	"	"	6	Do. K, 6 p. c. Prf.	172–177	–1	3 7 10
1,061,150	"	12 June	4	Do. 4 p. c. Deb. Stk.	138–143	..	2 15 11
294,850	"	"	4½	Do. 4½ p. c do.	150–155	..	2 18 0
908,000	"	"	6	Do. 6 p. c. do.	207–212	..	2 16 7
70,000	10	29 Oct.	6	Hongkong & China Limited	12–13*	+½	4 12 4

Issue.	Share.	When Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
3,800,000	Stck.	14 May	12	Imperial Continental	210–220	–15	5 9 1
376,400	100	1 Aug.	4	Do. 4 p. c. Debs. Red.	100–103	..	3 17 8
473,600	Stck.	13 Aug.	3½	Do. 3½ p. c. Deb. Stk	108–110	..	3 3 8
75,000	5	26 June	6	Malta & Mediterranean, Ltd.	6–6½	..	4 12 4
560,000	100	1 Oct.	5	Met. of Melbourne, 5 p. c. Deb.	113–116	..	4 6 2
250,000	100	"	4½	Do. 4½ p. c. Debs.	108–110	..	4 1 10
541,920	20	12 June	5	Monte Video, Limited	16½–17½	..	5 14 3
150,000	5	29 May	8	Oriental, Limited	8¼–9	..	4 8 11
135,000	5	"	8	Do. New, £4 10s. paid	7¼–7⅝	..	4 12 10
15,000	5	"	8	Do. do. 1879, £1 paid	1⅝–2	..	4 0 0
60,000	5	16 Sept.	7	Ottoman, Limited	5–5½	..	6 7 3
420,000	100	2 Nov.	6	People's Gas } 1st Mtg. Bds.	102–107*	..	5 12 1
500,000	100	1 June	6	of Chicago } 2nd Do.	102–107	..	5 12 1
250,000	10	30 Sept.	10	San Paulo, Limited	13¾–14¼	..	6 18 0
5,475,000	Stck.	13 Aug.	5 7/10	South Metrop., 4 p.c. Ord.	142–146	–1½	3 11 3
820,000	"	15 July	5	Do. 5 p. c. Deb. Stk.	171–174	+1	2 17 6
60,000	Stck.	16 Sept.	11½	Tottenham & Edmonton, A	265–275	..	4 3 7
60,000	"	"	8½	Do. B	180–190	..	4 9 5
170,380	10	29 May	10	Tuscan, Limited.	13¾–14¼	..	6 18 0
149,900	10	1 July	5	Do. 5 p. c. Debs. Red.	100–102	..	4 18 0
				WATER COMPANIES.			
746,123	Stck.	26 June	10½	Chelsea, Ordinary	338–343	–2	2 19 9
150,000	"	"	5	Do. 5 p. c. Pref.	177–182	..	2 14 11
160,000	"	"	4½	Do. 4½ p. c. Pref. Stk., 1875	160–164	..	2 14 10
175,785	"	30 Sept.	4½	Do. 4½ p. c. Deb. Stock	162–167	..	2 13 11
1,719,514	Stck.	15 Oct.	7	East London, Ordinary	215–220	..	3 3 8
554,740	"	26 June	4½	Do. 4½ p. c. Deb. Stk.	163–168	..	2 13 7
225,000	"	"	3	Do. 3 p. c. Deb. Stk.	105–107	..	2 16 1
700,000	50	12 June	7½	Grand Junction, 10 p.c. max.	113–118	–2	3 3 6
295,000	Stck.	30 Sept.	4	Do. 4 p. c. Deb. Stk.	150–155	..	2 11 7
708,000	Stck.	13 Aug.	12	Kent	335–345	–5	3 9 7
160,000	"	"	7	Do. New, 7 p. c. max.	217–222	..	3 3 0
1,043,800	100	26 June	7½	Lambeth, 10 p. c. max.	255–260	..	2 17 8
406,200	100	"	7½	Do. 7½ p. c. max.	223–228	–2	3 5 7
350,000	Stck.	30 Sept.	4	Do. 4 p. c. Deb. Stk.	148–153	..	2 12 3
500,000	100	13 Aug.	12 3/10	New River, New Shares	418–423	..	3 1 0
1,000,000	Stck.	30 July	4	Do. 4 p. c. Deb. Stk.	150–155	..	2 11 7
902,300	Stck.	12 June	4	S'thwk & V'xhall, Ordinary	154–159	..	2 10 4
126,500	100	"	4	Do. Do. 7½ p. c. Max.	148–153	–2	2 12 3
489,200	Stck.	"	5	Do. Do. 5 p. c. Pref.	175–180	..	2 15 6
1,019,585	"	30 Sept.	4	Do. 4 p. c. A Deb. Stk.	148–152	..	2 12 7
1,155,066	Stck.	12 June	10	West Middlesex	318–323	–2	3 1 11
200,000	"	"	4½	Do. 4½ p. c. Deb. Stk.	165–170	..	2 12 11

*Ex div.

Incandescent Gas Lighting for Sydney.—The Municipality of Sydney, New South Wales, have decided, after exhaustive tests, to have the town lighted by the Welsbach incandescent gas system; and the contract has been placed with the Australasian Incandescent Gas-Light Company, Limited, by the Australian Gas-Light Company, Limited, of Sydney.

The North Shields Water-Works and the Corporation.—Last Thursday, a public meeting was held at North Shields for the purpose of considering a resolution consenting to the Town Council promoting a Bill in the next session of Parliament to take the water supply of the borough into their own hands, and to acquire the undertaking of the North Shields Water-Works Company. The Mayor (Alderman G. Armstrong) proposed the resolution, which was carried by a large majority. A poll was demanded.

The Progress of the Fylde Water Company.—In presenting the report and accounts (*ante*, p. 696) at the recent half-yearly meeting of the shareholders of the above Company, Mr. A. Simpson, the Chairman, called attention to the remarkable increase in the profits since 1892. He said the profits of the past half year amounted to £11,900, against £7800 in 1892, £8700 in 1893, £9000 in 1894, and £11,100 in 1895. Dividends of 10, 7, and 4 per cent. were declared. At a subsequent extraordinary general meeting, the Directors were empowered to issue £100,000 worth of stock, either preference or ordinary, and to exercise the borrowing powers recently granted by Parliament.

Newton Abbot Gas Company.—The annual general meeting of this Company was held on the 20th ult.—Mr. L. Bearne presiding. The revenue account showed that the total receipts amounted to £6955, which was rather below the amount received in 1895. There was an increase in the receipts for gas and meter rentals; but a falling off in the revenue from coke, tar, sulphate of ammonia, and spent lime. After meeting the expenditure, there was a disposable balance sufficient to pay a dividend amounting to £1670 on the 800 shares, and leave a surplus of £170. This was carried to the capital account, which now amounts to £26,953. The report and accounts were adopted, and the dividend declared.

The Proposed Purchase of the Chichester Water-Works by the Corporation.—This matter has been at a deadlock for some time, in consequence of a minority of the Council declining to accede to the resolution to promote a Bill in Parliament to sanction the purchase. This peculiar position has been accentuated by the fact that the conditional contract for the carrying out of the scheme was so signed that it appeared clear that, unless a poll was taken, the Corporation would be liable for penalties for breach of agreement. The difficulty was, however, ended on Monday evening last week by the opposition voting for the city being polled; but making it clear that they did so only in order that the ratepayers might have an opportunity of voting on the question, and not because their opinion had undergone any change as to the undesirability of the purchase. At a ratepayers' meeting on the following night, the scheme was defeated by a large majority; and a poll was demanded.

Huddersfield Water-Works Extensions.—The Huddersfield Corporation have decided to proceed at once with the construction of the Blakeley reservoir and other necessary work in conjunction therewith, so that it may be completed, as nearly as possible, at the same time as the Butterley reservoir. The Borough Accountant has reported that the expenditure connected with the construction of the Butterley reservoir and the intended Blakeley reservoir to Sept. 30 last was respectively: Butterley, £132,188; Blakeley, £1326.

A Proposed Big Water Scheme for Pembrokeshire.—According to the "Local Government Journal," the London County Council are not alone in their desire to embark upon a huge water scheme. The Pembrokeshire County Council have, it is said, proved the feasibility of a proposal to furnish an ample supply of good water to every town and village in that corner of the Principality by means of water-works on Priscilly Mountain. They contend that such works could be established at a cost of less than £200,000, and that this would come much cheaper to the county as a whole than independent works started by the several town and district councils. Our contemporary is afraid there are many difficulties in the way of the scheme as it stands; but if it really possesses all the merits claimed for it, it is thought it would meet a want long experienced in many parts of Pembrokeshire.

Outbreak of Lead Poisoning in Derbyshire.—A large number of cases of lead-poisoning in the colliery village of Mosborough, which lies between Sheffield and Chesterfield, are causing a good deal of local indignation against the Chesterfield District Council, who, it is alleged, have not taken proper steps to prevent the trouble, though they have been advised by Mr. E. M. Eaton, of Sheffield, who resides at Mosborough, what to do. A public meeting has been held on the subject, and a resolution passed calling upon the Local Authority to take immediate steps to improve the water supply; and samples of the water have been forwarded to the Local Government Board with a request that they will take up the matter. Dr. West Jones, the Medical Officer for the Eckington Collieries, says that in his extensive practice throughout the district, he has not been free from lead colic for twelve months.

The Falmouth Town Council and the Gas and Water Works.—The Falmouth Urban Sanitary Authority had a meeting on Monday last week, to receive a report from the Committee appointed with reference to the proposed purchase of the gas and water works, recommending that the scheme be proceeded with on the lines indicated in the report of Mr. Silverthorne (*ante*, p. 797). After some discussion, it was decided that, for the purpose of carrying out the purchase of the water-works, and promoting a Bill in Parliament, the Authority should relegate its powers to the Town Council. The members then sat as the Council; and the resolution come to by the Authority having been read, the Town Clerk (Mr. J. H. Gean) was authorized to call the statutory meeting under the Borough Funds Act. It was further resolved to instruct the Gas and Water Committees to approach the Gas and Water Companies, with a view to ascertaining if they will accept the terms laid down in Mr. Silverthorne's report, or what terms and conditions they will accept, and report the matter to the Council.

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Cape Town District Water-Works Company, Limited.—The report of this Company for the year ended June 30 states that the net profit, including £1006 brought forward, amounted to £3724. The Directors propose the payment of a dividend of 3½ per cent.; carrying forward £924.

A Water Supply Scheme for East Northumberland.—Mr. Charles Barron, J.P., the Chairman of the Cowpen District Council, has proposed a scheme for providing the whole of Eastern Northumberland with an adequate supply of water. His proposal involves the conveyance of water from the Tosson Springs in the Rothbury Hills; and if properly carried out, it will require an outlay of £100,000. All the local authorities in East Northumberland will be invited to co-operate in the scheme.

The Tynemouth Town Council and the Water-Works.—A meeting of the Tynemouth Town Council was held last Tuesday afternoon for the purpose of passing a resolution on the question of the water supply of the borough. Alderman Elliot, the Chairman of the Parliamentary and Water Committee, proposed—"That the Council promote in the next session of Parliament a Bill for the purpose of taking the supply of water within the borough into their own hands, and for acquiring the undertaking of the Company of Proprietors of the North Shields Water-Works; and that the consent of the owners and ratepayers to the promotion of the said Bill be obtained in the manner provided by the Municipal Corporations (Borough Funds) Act, 1872." Mr. E. Marshall seconded the motion; and, after a protest from Mr. J. Eskdale, who failed to see that the undertaking would be a source of profit to the ratepayers, it was carried.

Retford Corporation Gas-Works.—The annual report of the Retford Corporation Gas Committee has been issued. It states that the amount over expended on capital account now stands at £181. The Committee propose to meet this and provide for further expenditure by transferring £500 from the net revenue to capital account. The total amount which has been expended on the undertaking is £42,000; and of this £10,500 has been paid off; £5000 by means of the sinking fund, and £5500 out of the reserve fund—leaving £31,500 still owing. The net profit for the year, after paying all dividends, interest, and sinking fund, was £1399; making the amount now standing to the credit of the net revenue account £2925. The Committee propose to pay to the Corporation £1000 for the improvement of the borough and the benefit of the inhabitants. The Committee also propose, as from the end of the present year, to abolish meter-rents, at a cost to the undertaking of nearly £200 per annum.

The Harrogate Town Council and the Water-Works.—At a special meeting of the Harrogate Town Council last Friday, it was decided to promote a Bill in Parliament to empower the Corporation to purchase, by compulsion or agreement, the undertaking of the Harrogate Water Company. Alderman Fortune stated that, before going to Parliament, they would do the very best they could to come to an amicable arrangement with the Company. At present they had reasonable hopes of dealing with them. They did not expect to get the property for less than it was worth, but he thought it was likely their views would have the favourable consideration of the Directors; and if they could arrange with them, it would very much reduce the cost of getting the proposed Bill, for in any case they must go forward with it, so as to secure certain powers. The authorized capital of the Company is £95,800, of which £84,580 has been called up; and up to the present time, a maximum dividend of 7 per cent. per annum has been paid to the shareholders.

Plymstock Water Supply.—An inquiry respecting the proposal of the Plympton District Council to borrow three sums of £6000, £575, and £125 for providing a water supply for Plymstock and neighbouring villages, has lately been held by Colonel W. M. Ducat, one of the Local Government Board Inspectors. The scheme that was proposed had been prepared by Mr. H. E. Frances; the idea being to provide a supply for the villages of Plymstock, Hooe, Elburton, Higher Hooe, Pomphlete, Oreston, and Turnchapel, from works already in existence for the supply of Plympton St. Mary. Strong opposition was, however, offered to this plan. Mr. Duke appeared to represent 436 dissenting ratepayers, out of some 500, and the Trustees of the Bayley Estates, which are situated in the district. Mr. Frances explained that his scheme would give a supply of about 15 gallons per head per day. Mr. S. Noy Scott, the Medical Officer of Health for the district, and other witnesses, gave evidence in support of the scheme, which it was said the Parish Council approved of, though there was considerable opposition to it among the inhabitants. Mr. Duke contended that the works for the supply of Plympton were constructed for serving a population of only 3000; and now it was proposed to double the burden upon them. The quantity of water coming in at the Plympton intake was 86,000 gallons a day last summer; and to supply the present population of Plympton and Plymstock with 20 gallons a day, which should be the minimum quantity, 120,000 gallons would be required. The Plympton scheme would cost the district £410 per annum, which was equal to a rate of 1s. 8d. or 1s. 9d. in the pound. Evidence was given that Bayley's Trustees had three reservoirs from which they could supply part of the district; and Mr. G. D. Bellamy expressed the opinion that the supply from Plympton would be inadequate. Water could, he believed, be found in the parish; and, if not, a supply should be derived from the Corporation of Plymouth. At the conclusion of the inquiry, the Inspector, at the request of both sides, visited the Plympton intake.

A Question as to Ante-Dating a Certificate for Water-Works Machinery.—The dating of a certificate respecting the supply and erection of pumping-engines at the water-works, was the subject of some comment at the last meeting of the Coventry City Council. The minutes of the Water Committee recorded that, at one of their meetings, there was read a certificate of Mr. C. Hawksley, dated Oct. 7, of the completion, by Messrs. Moreland and Son, of their contract for the supply and erection of engines on July 16 last. Dr. Fowler protested against the way the Corporation had been served in this matter, though he believed they were bound to pay for the engines, and to accept the certificate. He asked the Chairman of the Committee whether he would again bring the certificate before the members, in order that it might be some guide to the Corporation in the selection of their advisers in future. At the last Committee meeting Mr. Hawksley attended, he suggested that the Corporation should take over the engines from the contractors; but the Committee were unanimously of opinion that a certificate should be given by the Engineer before they did so. It was stated in the contract that the engines should be completed and running in good working order for three months before they were taken over. When asked if they were then in working order, Mr. Hawksley answered that they were not technically complete. In view of this, he thought the Council had been badly served in having the certificate dated three months back. Alderman Read said he should be pleased to comply with Dr. Fowler's request. It was a surprise to find, after waiting as they had done for these engines to be certified as correct, that the certificate for which they asked should have been dated back three months; stating that the engines had been in working order all that time. Under the contract, they were to have three months' use of the engines after the certificate was given. Under this impression, they were getting ready to put in a Resident Engineer for a little time before the engines were handed over. Instead of this, they had had to do everything in a hurry. The Committee were surprised at what had to be done; and he should be pleased to introduce the matter again.

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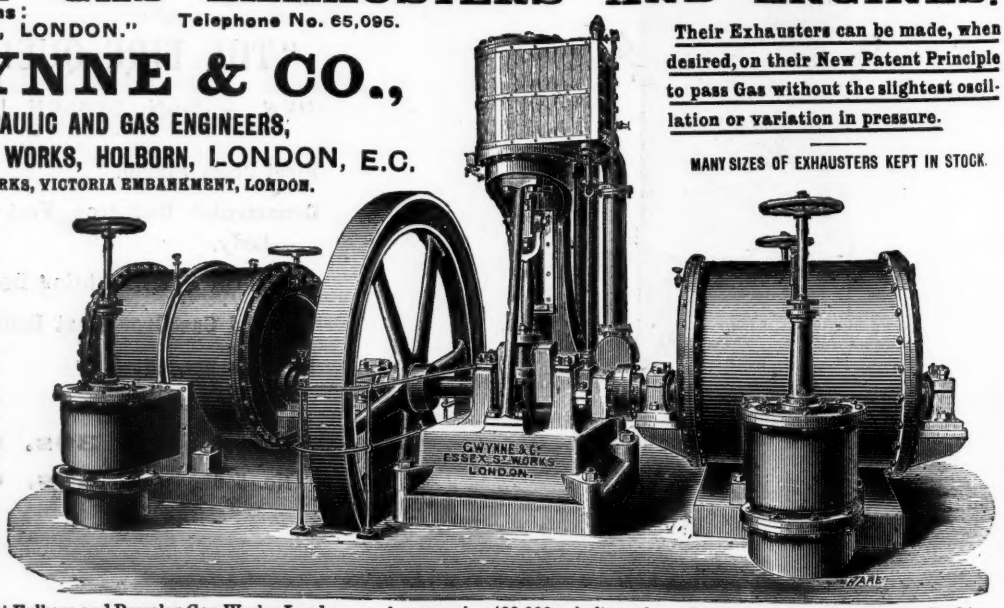

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J. F. BLAKELEY, Gas Engineer, Ravensthorpe, YORKS.

FOR SALE, Wrought-Iron Annular CONDENSER—Eighteen Tubes, 20 feet by 2 ft. 4 in. diameter; 14-inch Inlets. In first-rate condition. Passing 1 million cubic feet per day. Price £150. Can be seen at work. Also STATION METER for 40,000 cubic feet per hour. Price £80. Both being replaced by larger.
Apply to JOHN CHEW, Gas Engineer, BLACKPOOL.

WIDNES CORPORATION GAS AND WATER WORKS.

GAS PLANT, &c., for Sale—Annular CONDENSER, MANN and WALKER TOWER SCRUBBER, 88 ft. by 8 ft., and a WALKER PURIFYING-MACHINE of 1 Million Cubic Feet capacity per diem. The Valves and Connections for the above are 12 inches diameter.
Particulars may be obtained on application to Mr. ISAAC CARR, Assoc.M.Inst.C.E., Gas-Works, WIDNES.

OIL-GAS BENZOL for Enriching Coal Gas. A few Thousand Gallons to dispose of. Apply, by letter, in the first place, to No. 2714, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

COMPLETE GAS PLANT FOR SALE.

TO BE SOLD separately, or in one lot—

One large Double-Lift HOLDER, with Cast-Iron Tank, 46 ft. 6 in. diameter by 16 ft. deep, with Inlet and Outlet Pipes.
Two Double-Lift HOLDERS, 34 ft. 4 in. diameter outer, 32 ft. 10 in. inner, 14 ft. 3 in. deep, with Pipes, &c.
One GOVERNOR, SYPHON BOXES, VALVES, &c.
One STATION METER, with Valves (new), Braddock's make.
One Set of four PURIFIERS, 7 ft. square by 4 ft. deep, Walker's make, with Grids and one of their Centre-Valves, Connections, and Lifting Gear.
One TAR-PUMP and STORE BOILER.
One Eclipse WASHER-SCRUBBER, Laycock and Clapham, with Pulleys and Governor, erected in 1890.
One EXHAUSTER, with 12-inch Valves and Connections.
One Horizontal CONDENSER, with fourteen 8-inch Pipes, 18 ft. long, with Bye-Pass, Valves, and Connections.
Twenty RETORT MOUTHPIECES, with Lids and Duplicates, Dip, Ascension, and Bridge Pipes, Hydraulic Main and Valve, Fire-Doors, Buckstaves, and Tie-Rods.
12-inch and 8 inch MAINS, at per ton.
12-inch VALVES, at each.

For further Particulars and Prices, apply to H. I. WILLIAMS AND Co., Kidsgrove, STOKE-ON TRENT.

URBAN DISTRICT COUNCIL OF BUXTON.

TENDERS are invited for the supply of 500 yards of 9-inch and 300 yards of 3-inch T. & B. PIPES.

Particulars may be obtained of Mr. G. Smedley, Town Hall, Buxton.

The Council do not bind themselves to accept the lowest or any tender.

By order,
JOSIAH TAYLOR,
Clerk.

Town Hall, Buxton,
Oct. 29, 1896.

CORPORATION OF LEICESTER.

RETORTS AND FIRE-BRICKS.

THE Gas and Electric Lighting Com- mittee of the above Corporation are prepared to receive TENDERS for the supply and delivery of RETORTS and FIRE-BRICKS.

Specification, Quantities, and Form of Tender can be obtained from the Engineer.

Tenders, addressed to Alderman Lennard, Chairman, and endorsed "Tender for Retorts, &c.," to be delivered at these Offices not later than Eleven o'clock a.m., on Saturday, Nov. 7, 1896.

The Committee do not bind themselves to accept the lowest or any tender.

ALFRED COLSON, M.Inst.C.E.,
Engineer and Manager.

Offices: Millstone Lane,
Leicester, Oct. 17, 1896.

COUNTY BOROUGH OF BRADFORD.

TO RETORT MANUFACTURERS.

THE Gas and Electricity Supply Com- mittee of the Bradford Corporation are prepared to receive TENDERS for the supply of RETORTS, and of FIRE-BRICKS and FIRE-CLAY required in the fixing of such Retorts.

Form of Tender may be obtained on application to Mr. Wood, at the Gas Office, Town Hall, Bradford.

Tenders, endorsed "Tender for Retorts," to be delivered to me on or before Wednesday, the 18th of November next.

An undertaking must be given by each Contractor that he will pay to the workmen employed by him not less than the minimum standard rate of Wages.

The Committee do not bind themselves to accept the lowest or any tender.

By order,
GEORGE M'GUIRE,
Town Clerk.

Town Clerk's Office, Town Hall,
Bradford, Oct. 23, 1896.

MAIDSTONE GAS COMPANY.

SALE BY TENDER OF £14,000 THREE PER CENT. PERPETUAL DEBENTURE STOCK.
MINIMUM PRICE, £100 PER £100 STOCK.

NOTICE is Hereby Given, that it is the intention of the Directors of this Company to sell BY TENDER £14,000 of THREE PER CENT. PERPETUAL DEBENTURE STOCK, in accordance with the Provisions of the Maidstone Gas Order, 1896.

The Capital of the Company is £92,958.

Dividends from 1887 to 1896 have been 10½ to 11 per cent. per annum.

The Debenture Stock will rank before the whole of the Company's authorized Share Capital.

Particulars of same, with Form of Tender, can be obtained on application to the undersigned; and tenders must be delivered at the Company's Offices, Gas-Works, Maidstone, on or before Ten o'clock in the Forenoon on Thursday, the 19th day of November next.

The Stock will be allotted to the highest bidders; but no tender will be accepted at a lower price than at the rate of £100 money for each £100 Debenture Stock.

By order,
HOAR, HOWLETT, AND TATHAM,
Clerks to the Company.

9, King Street, Maidstone,
Oct. 21, 1896.

BRENTFORD GAS COMPANY.

SALE BY TENDER OF £30,000 NEW STOCK, 1881.

IN Pursuance of the Brentford Gas Order, 1881, NOTICE IS HEREBY GIVEN, that it is the intention of the Directors of this Company to sell BY TENDER £30,000 of NEW STOCK, 1881, of the Company, to be paid up in full on or before the 1st day of December next, such Stock being a portion of Additional Capital authorized to be raised by Resolutions passed at an Ordinary Meeting of Proprietors, held on the 21st day of February, 1890, under the Powers of the above-mentioned Order.

Particulars and Conditions of Tender may be obtained on application at this Office; and sealed tenders must be sent in not later than Twelve o'clock (Noon) on Monday, the 16th day of November next.

By order,
WM. CROXFORD,
Secretary.

Office: Brentford Gas Company,
Brentford, Oct. 16, 1895.

ISSUE OF STOCKS AND SHARES BY AUCTION UNDER PARLIAMENTARY POWERS.

MR. ALFRED RICHARDS undertakes the issuing by Auction of GAS AND WATER SHARES under Parliamentary Powers.

He also holds MONTHLY SALES of GAS AND WATER SHARES at the Auction Mart, Tokenhouse Yard, E.C.

Terms for the issuing of Capital, and also for offering to auction Gas and Water Shares, and all Particulars relating thereto, may be had of Mr. Alfred Richards.

Offices: 18, FINSBURY CIRCUS, E.C.

GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS will Sell by AUCTION, at the Mart, Tokenhouse Yard, E.C., on Tuesday, Nov. 24, at Two o'clock precisely, in Lots, the following high-class Investments:—

ALDERSHOT GAS AND WATER COMPANY (a new issue by order of the Directors)—200 £10 Five per cent. Preference Shares.
GRAYS GAS COMPANY, LIMITED—141 £10 fully-paid Shares.
WORTHING GASLIGHT AND COKE COMPANY (a new issue by order of the Directors)—200 £10 Shares.
CRAYS GAS COMPANY—96 £10 fully-paid Shares.
CRYSTAL PALACE DISTRICT GAS COMPANY—£2000 Five per cent. Stock.
HARROW AND STANMORE GAS COMPANY—110 £10 Shares.
KING'S LYNN GAS COMPANY—£550 Ordinary Stock.
CROYDON COMMERCIAL GAS COMPANY—£75 "B" Stock.

Particulars of the AUCTIONEER, 18, Finsbury Circus, LONDON, E.C.

Now Ready, Price 15s., Limp Cloth, the Sixteenth Yearly.

ANALYSIS OF THE ACCOUNTS
OF THE
Metropolitan Water Companies,

Chelsea, East London, Grand Junction, Kent, Lambeth, New River, Southwark and Vauxhall, and West Middlesex—showing the Capital, Income, Expenditure, Profits, and Dividends per Million and per Thousand Gallons of Water supplied; the proportion of Expenditure and Profits to Gross Income; and the Income, Expenditure, and Profits per House, &c., supplied for the Year ended December 31, 1895, or March 31, 1896, together with the quantity of Water supplied, the estimated daily quantity supplied for domestic and other purposes, the quantity supplied per head of population, &c., &c., for the Year ended December 31, 1895.

Compiled and arranged by
ALFRED LASS, F.C.A.

LONDON:
WALTER KING, 11, Bolt Court, Fleet Street, E.C.

TAR AND LIQUOR PURCHASED.

MAJOR & CO., Ltd.,
SUCCESSORS TO
JOHN CLARKSON MAJOR,
(Established 1851)
Tar Distillers and Manufacturing Chemists,
HULL & WOLVERHAMPTON.

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD
BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.
RAVENSTHORPE, NEAR DEWSBURY.

JAMES OAKES & Co.,
ALFRETON IRON-WORKS, DERBYSHIRE,
AND
Wenlock Iron Wharf, 21 & 22, Wharf Road,
CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1¼ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts and covers, and rendering leakage impossible.

THORNLEY GAS COALS
WORKED BY THE
WEARDALE IRON & COAL Co., Ld.
OUT OF THEIR
THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by
Messrs. J. & H. S. PATTINSON, *May 28, 1895.*

Yield of Gas per Ton . .	10,500 Cub. Ft.
Illuminating Power . .	16·9 Candles.
Coke (of good quality) . .	67·5 per Cent.
Sulphur	0·58 ,,
Ash	2·73 ,,

For Price, &c., apply to the
WEARDALE IRON & COAL Co., Ld.
QUAYSIDE, NEWCASTLE-ON-TYNE.

HOLMSIDE GAS COALS.
PRESENT DAILY PRODUCE OVER 4000 TONS.

LATEST ANALYSIS—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation.

Yield of Gas Per Ton. . 11,205 Cubic Feet.
Illuminating Power, 16 7/10 Stand. Sperm. Candl.
Coke (of good & pure quality) 13¾ Cwt. Per Ton.
Sulphur . . . . A little over 1 Per Cent.
Ash . . . . . Under 1 Per Cent.
Tar . . . . . 163 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 103 Lbs. (Avoir.) Per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR PELTON GAS COALS.
PRESENT DAILY PRODUCE AVAILABLE 2500 TONS.

RESULTS OF DIFFERENT ANALYSES:—

Yield of Gas Per Ton. . 10,500 Cubic Feet.
Illuminating Power . 17 Stand. Sperm Candl.
Coke (of excellent quality) . 13½ Cwt. Per Ton.
Sulphur . . . . . 1·13 Per Cent.
Ash. . . . . 1·34 Per Cent.
Tar. . . . . 180 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 94½ Lbs. (Avoir.) Per Ton.

The HOLMSIDE and SOUTH MOOR COALFIELD possesses *a very great quantity of the best Coal;* and, whilst other Coal-Fields are becoming exhausted, this one is only being opened out, so that *the quality* of both the HOLMSIDE COALS, and the SOUTH MOOR COALS *may be relied upon for all practical purposes.*

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,
HOLMSIDE AND SOUTH MOOR OFFICES,
NEWCASTLE-UPON-TYNE.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED

— *v* —

"DE MARE" COMPANY.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED.

— *v.* —

"SUNLIGHT" COMPANY.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED HEREBY GIVE NOTICE, as follows:—

VALIDITY. The Company's Patent has been declared VALID ON ALL POINTS after a Fifteen-Day Trial.

NATURE OF INVENTION. The Invention was described by Mr. Justice Wills as a "PIONEER INVENTION."

SCOPE OF PATENT. The Patent HAS BEEN GIVEN A WIDE CONSTRUCTION; and it was held that the protection given by it was not confined to Mantles manufactured according to the particular prescriptions set out in the Specification.

SHAPE OF MANTLE. The Judge held that a Mantle, even if made in a different form or shape (such as the "De Mare" Fringe or Plume), IS STILL AN INFRINGEMENT of the "Welsbach" Patent.

"DE MARE" JUDGMENT. Judgment for an INJUNCTION, WITH FULL COSTS, has been given against the "De Mare" Incandescent Gas-Light System.

"SUNLIGHT" JUDGMENT. Judgment was given AGAINST the "Sunlight" Incandescent Gas-Lamp Company, Limited, on the question of the VALIDITY OF THE PLAINTIFFS' PATENT.

"SUNLIGHT" MANTLES. Last about 100 hours.

"WELSBACH" MANTLES. Last about 1000 hours.

"Sunlight" Mantles BURN DOUBLE THE GAS to produce the same candle power as the Incandescent Gas-Light Company's Mantles.

Users of "Sunlight" Mantles are applying to the Incandescent Gas-Light Company to REPLACE THEM BY THEIR OWN MANTLES.

WARNING. Users of the Incandescent Gas-Light Company's Mantles upon "Sunlight" Burners ARE INFRINGERS OF THE COMPANY'S PATENT, AND WILL BE AT ONCE PROCEEDED AGAINST.

COSTS. Certificates of the Validity of the Company's Patent have been granted both by Mr. Justice Romer and Mr. Justice Wills entitling the Company to Solicitor and Client Costs, which will, IN ALL CASES, BE RIGOROUSLY ENFORCED.

INFRINGERS. The Incandescent Gas-Light Company WILL TAKE PROCEEDINGS AGAINST ALL PERSONS INFRINGING THEIR PATENT WHETHER

MAKERS,
WHOLESALE DEALERS,
RETAILERS,
or
USERS.

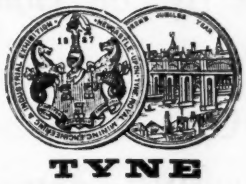
Users of the Company's Mantles upon Burners not sold by the Company ARE INFRINGERS.

"LIMITED LICENSE" WARNING. Judgments have already been obtained against such users from Mr. Justice Chitty, Mr. Justice Stirling, Mr. Justice Kekewich, and Mr. Justice North.

FAITHFULL & OWEN,
11, Victoria Street,
Westminster.
Solicitors to the Incandescent Gas-Light Company, Limited.

April, 1896.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887,
for
CANNEL & COAL.



TYNE
BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	17·8 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

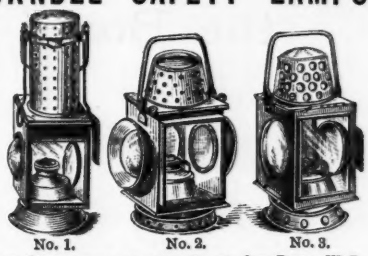
Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to
THOS. W. DANCE & SONS,
COAL OWNERS, NEWCASTLE-ON-TYNE:
OR
E. FOSTER & CO.,
12, JOHN STREET, ADELPHI, LONDON, W.C.

TROTTER, HAINES, & CORBETT,
Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.
Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY.
SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.
LONDON OFFICE: R. CULL, 84, OLD BROAD ST., E.C.

COKE-BREAKERS,
PRICES REDUCED.
(THOMAS & SOMERVILLE'S PATENT)
New Design, with two Cutting Rollers, making less Breeze than their old pattern.
GEORGE WALLER & CO.,
165, QUEEN VICTORIA STREET, E.C.,
And at STROUD, GLOUCESTERSHIRE.

ARMSTRONG'S PATENT
CANDLE SAFETY LAMPS.



No. 1. No. 2. No. 3.
43, MANCHESTER STREET, GRAY'S INN ROAD, W.C.

The Cheapest House in the Trade for
LEVER LOCKS
FOR
GAS-METERS.
Joseph Oakley & Co.
Excelsior Works,
WILLENHALL.

BOLDON GAS COALS.
Worked by THE HARTON COAL CO., LTD.
Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton	10,500	Cubic Feet.
Illuminating Power	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Crystal Palace District Gas Company, Danish Gas Company, Bombay Gas Company, San Paulo Gas Company, Alliance and Dublin Consumers' Gas Company, Ipswich Gaslight Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For Prices, &c., apply to the
HARTON COAL COMPANY,
LIMITED,
Newcastle-on-Tyne.
W. H. PARKINSON,
FITTER.

WATER-GAS PLANT

Messrs. S. CUTLER & SONS beg to announce that the CARBURETTED WATER-GAS PLANT erected by them at Hornsey is now in operation; and they have been favoured with the following letter from the Board of Directors.

Hornsey (Middlesex) Gas Company,
Offices: 63, Chancery Lane, W.C.,
London, Oct. 16, 1896.

Messrs. S. CUTLER & SONS,
Providence Iron-Works, MILLWALL, E.

GENTLEMEN,

I am instructed by the Board of Directors of the Hornsey Gas Company to state that the reports of the working of the Water-Gas Plant from the Engineer are most satisfactory, exceeding considerably your contract Specification. The delay has been unfortunate, but that is in no way your fault.

I am, Gentlemen, Yours truly,
S. J. WILLIAMS,
Secretary.

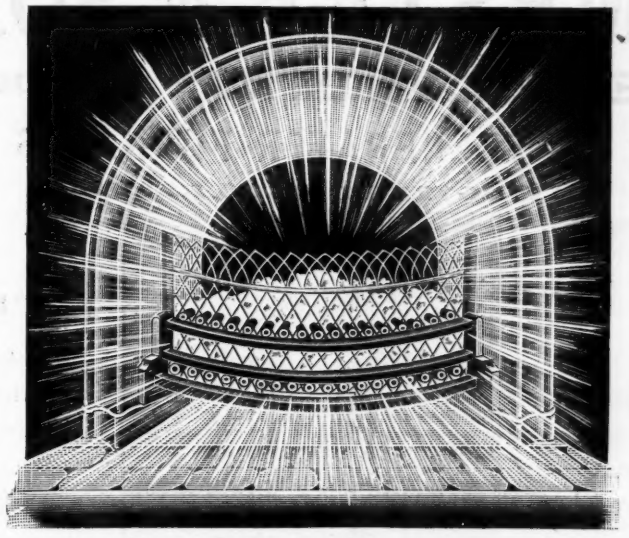
This Plant includes several new and important features; and Messrs. Cutler invite Gas Engineers who are contemplating the adoption of Water-Gas Plant to favour them with their inquiries.

IMPORTANT TO GAS MANAGERS.

THE
INCANDESCENT FIRE-MANTEL
A POPULAR APPLIANCE FOR USE WITH GAS-WORKS COKE.

ADJUSTABLE and SELF-FITTING to any ORDINARY FIRE-GRATE.

A PROFITABLE FIELD FOR ALL SURPLUS COKE.



CREATES AN IMMEDIATE HOME DEMAND FOR GAS-WORKS COKE.

NO ALTERATION TO EXISTING FIRE-GRATES.

Prices from 5s. 6d. upwards.

USUAL TRADE DISCOUNTS TO GAS COMPANIES DEALING WITH THE COMPANY DIRECT.

THE INCANDESCENT FIRE-MANTEL AND STOVE COMPANY, LIMITED, beg to intimate to the management of Gas Undertakings that they are now fully prepared to despatch **WHOLESALE ORDERS** for Fire-Mantels **THE SAME DAY AS RECEIVED.**

It is requested that, in view of important Improvements introduced into the construction of the Mantel, ALL ORDERS previously entrusted to the original Fire Frame Company BE RENEWED in accordance with the instructions embodied in the Company's NEW CATALOGUE just issued.

The Company have confidence in recommending Gas Companies and others to bring under the notice of their Consumers the unique advantages of the Fire-Mantel, as the popular favour with which the appliance is received affords a guarantee of the **rapid development of a profitable and permanent home demand for their Coke.**

THE
INCANDESCENT FIRE-MANTEL & STOVE COMPANY, Limited,
53, VICTORIA STREET, WESTMINSTER, S.W.

HEBBURN MAIN GAS COALS.

Yield of Gas per ton . . . . . 10,500 cub. ft.
Illuminating Power . . . . . 16·4 candles.
Coke . . . . . 68 per cent.

For Prices, f.o.b. Ship or Delivered by Rail, apply to
THE WALLSEND & HEBBURN COAL COMPANY, LTD.
B Lombard Street,
NEWCASTLE-ON-TYNE.
W. RICHARDSON, Fitter.

NEWBATTLE CANNEL.

Highest Results in Gas, & Excellent Coke.

QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

LONDONDERRY GAS COALS

FROM THE
MARQUIS OF LONDONDERRY'S
COLLIERIES,
COUNTY OF DURHAM.

Available output up to 5000 tons per day.
Yield of Gas 11,000 cubic feet per ton of Coal as per analysis by
Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO
S. J. DITCHFIELD,
SEAHAM HARBOUR, COUNTY OF DURHAM.

THOMAS TURTON AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.
LONDON OFFICE:
90, CANNON STREET, E.C.

R. DEMPSTER & SONS, L^D.

ELLAND, YORKS.

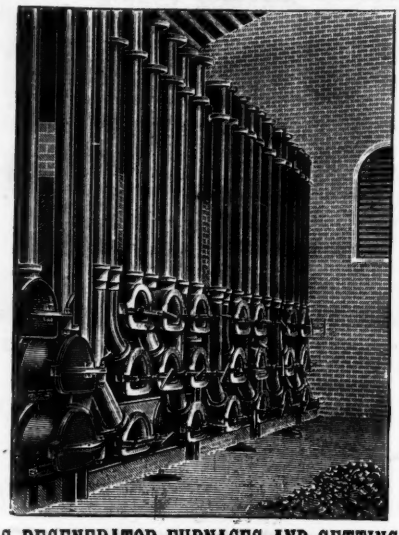
GENERATOR & REGENERATOR FURNACES & SETTINGS

GIVING VERY BEST RESULTS.

LEOMINSTER.

This COMPANY write—

"Mr. Chester's Furnaces and Settings you have erected for us work exceedingly well. Splendid heats under easy control. Nearly **50** per cent. less Coke used for Fuel than formerly. Very convenient for Sunday stopping. Work done in a thorough manner, to our entire satisfaction."



MATLOCK BATH.

Mr. LISTER writes that—

"The result of using Chester's Furnace and Setting for first Six Months of 1896 was to produce 26,000 cubic feet more gas, using 35 tons less coal, and having 171 tons more coke for sale, compared with same period of 1895."

ILLUSTRATION OF Mr. CHESTER'S REGENERATOR FURNACES AND SETTINGS RECENTLY ERECTED BY US AT CLEETHORPES, ABOUT WHICH Mr. BROCKWAY WRITES—

"Can make 8000 to 9000 per mouthpiece easily with **Mr. Chester's Regenerators** you have erected for us. Fuel Consumption much less than with our Generators. Heating of Retorts very even. Very well pleased with working. Results exceed expectations."

MOBBERLEY & PERRY

STOURBRIDGE.

Manufacture & supply best quality of
Gas Retorts (SEGMENTAL, HORIZONTAL, or INCLINED.)
Special Bricks & Blocks for GENERATOR & REGENERATOR FURNACES.
FIRE BRICKS, LUMPS, & TILES, BLUE STAFFORDSHIRE VITRIFIED BRICKS FOR PAVING, &c. &c.
EVERY REQUISITE FOR GAS-WORKS. Retort Setters sent to any part of the Kingdom.
Contractors for the erection of Retort-Benches complete.

London Agents:
BALE & HARDY, Gas Engineers and Contractors,
BRIDGE HOUSE, 181, QUEEN VICTORIA STREET, E.C.

JOHN BROWN & CO., LTD., SHEFFIELD.

Proprietors of

ALDWARKE MAIN, CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

ALDWARKE MAIN GAS COAL

Analysis: 12,600 Feet of 19-Candle Gas per Ton.

Value in Pounds of Sperm, 820·80.

VERY FREE FROM IMPURITIES.

TELEGRAMS: "ATLAS, SHEFFIELD."

THE SILICA FIRE-BRICK COMPANY,

OUGHTYBRIDGE, NEAR SHEFFIELD.

Established 1858. The First Manufactory of Silica and Dinas Fire-Bricks erected in England.

MANUFACTURERS OF

SILICA FIRE-BRICKS

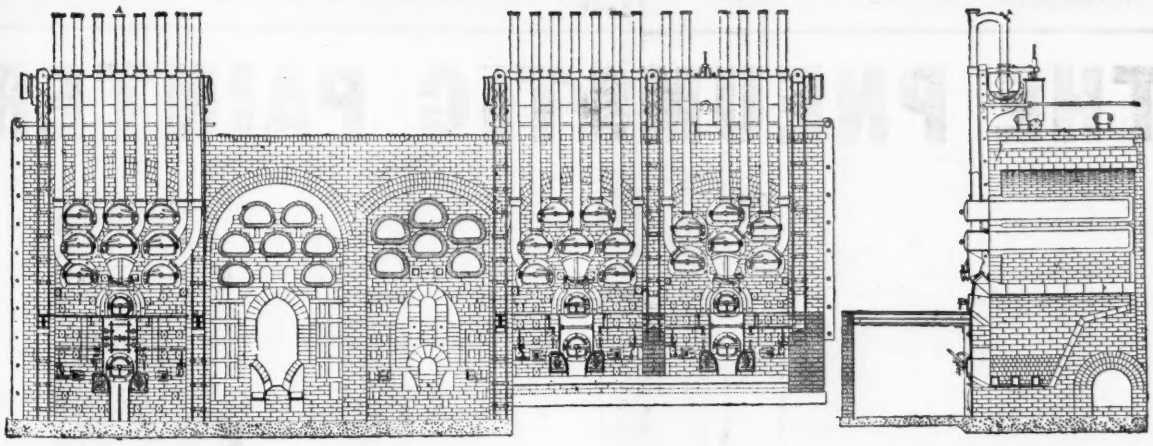
(TRADE MARK "SILICA")

Specially adapted for Siemens-Martin Gas-Furnaces; also for Gas, Copper, Iron, Steel, and other Furnaces where intense heat is required.

BESSEMER GANNISTER, STEEL-FURNACE GANNISTER, COPPER-FURNACE GANNISTER, IRONFOUNDERS' CUPOLA SAND, FINE-SETTING SILICA CEMENT, STEEL MOULDERS' COMPOSITION.

Our Silica Bricks have gained a high reputation for Unsurpassed Quality in most of the leading Firms in England and on the Continent. Export orders delivered Liverpool, Hull, Grimsby, or the Tyne.

HISLOP'S PATENT REGENERATIVE SETTINGS OF GAS-RETORTS.



THESE SETTINGS ARE POSITIVELY UNRIVALLED IN PRODUCTIVE CAPACITY, DURABILITY, AND SIMPLICITY OF MANAGEMENT. RETORTS OF ORDINARY DIMENSIONS CARBONIZING FROM 18 TO 24 CWT. OF ENGLISH AND 21 TO 26 CWT. OF SCOTCH COAL PER 24 HOURS, DEPENDING UPON THE NATURE OF THE COAL, AND PRODUCING UP TO FULLY 13,000 CUBIC FEET PER MOUTHPIECE IN THE SAME TIME, AND WITH THE SMALLEST EXPENDITURE OF FUEL ATTAINABLE, AND RETURNING IN PROFIT THE ENTIRE COST OF ERECTION WITHIN TWELVE TO EIGHTEEN MONTHS; AND THUS REDUCING TO INSIGNIFICANCE THE INCREASED COST OF THESE SETTINGS OVER THE COMMON OR GENERATOR FURNACE SYSTEMS.

THESE SETTINGS ARE EXTENSIVELY ADOPTED, AND ARE ERECTED UPON THE SHALLOW AND STAGE FLOOR PLANS. THEY ARE ADAPTED TO ANY EXISTING ARRANGEMENTS, AND PERFECT SATISFACTION GUARANTEED. THE COMPOSITION OF FIRE-RESISTING AND OTHER SPECIAL FIRE-CLAY MATERIALS FURNISHED IS OF THE HIGHEST ORDER; AND THE SYSTEM AS A WHOLE, AS NOW PERFECTED, IS THE RESULT OF LONG EXPERIENCE AND CAREFUL STUDY OF THE PRINCIPLES OF GASEOUS FIRING.

Drawings and Tenders are furnished for the complete erection of Benches, including Retort and Bench Mounting of the most modern and approved description; or existing Ovens fitted up with the Patentee's arrangements.

Full Particulars may be had on application to the Patentee's Agents: **Messrs. JONAS DRAKE AND SON**, Retort Setters and General Carbonizing Engineers, Ovenden, Halifax, Yorkshire, Sole Agents for England, Wales, and Foreign Countries; **C. M. HAMILTON**, Retort Setter and Contractor, 5, Stuart Street, Shawlands, Glasgow, Agent for Scotland and Ireland; and to the Principal Agent, **R. F. HISLOP** (Son of Patentee), General Constructing and Carbonizing Engineer, Gas-Works, Paisley, N.B.

HISLOP'S PATENT HYDRAULIC MAIN SEAL-REGULATING AND TAR-EXTRACTING VALVE is a *Sine qua non*

TO THE SATISFACTORY WORKING OF THE HYDRAULIC MAIN UNDER THE REGENERATIVE AS WELL AS OTHER SYSTEMS OF RETORTS. BEING LARGELY ADOPTED AND AFFORDING THE HIGHEST SATISFACTION.

The Patentee's SELF-SEALING CAPS FOR THE TOP OF ASCENSION-PIPES, and his "SPECIAL" FLUE PORT BOXES, are most important additions to his Carbonizing Plant.

SPENT LIMES NO LONGER WASTE PRODUCTS.

Under G. R. HISLOP'S Patents, all Spent Limes are effectively recovered at from one-third to one-half the cost of New Lime.

Further Information and Pamphlets from Principal Agent.

R. & A. MAIN,

GAS COOKING AND HEATING STOVES,

92, ALDERSGATE STREET, KINNING PARK,

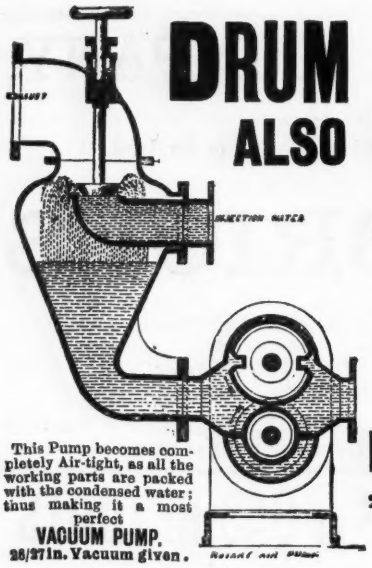
LONDON, E.C., & GLASGOW.

"The Force of the Piston Pump with the Capacity of the Centrifugal combined."

JOHNSON'S PATENT

DRUM PUMP AND EXHAUSTER

ALSO VACUUM PUMP AND CONDENSER.



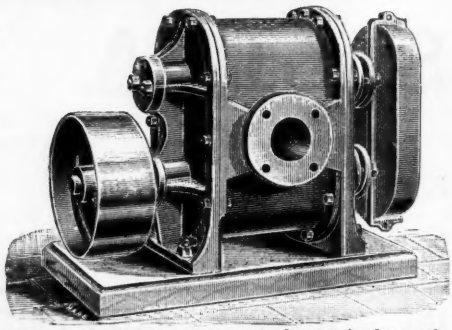
This Pump becomes completely Air-tight, as all the working parts are packed with the condensed water; thus making it a most perfect VACUUM PUMP. 28/27in. Vacuum given.

No Priming, Valves, or Frictional Working Parts.

The Pump of the future for quickly and economically moving large Bodies of Water, Semi-fluid, &c.

DRUM ENGINEERING Co.

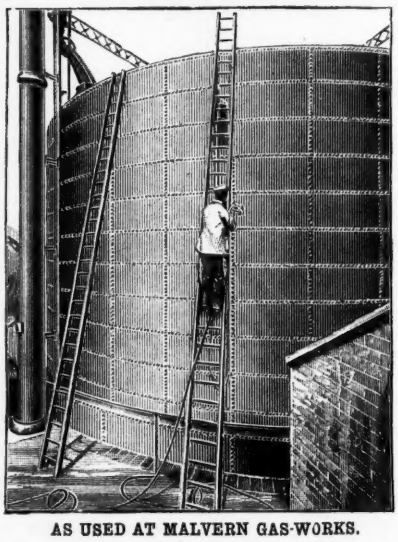
27, CHARLES ST., BRADFORD.



Blowers and Exhausters guaranteed, even at a slow speed, to give a working pressure of 3 lbs. and upwards, and this without losing power by creating frictional Heat.

THE PNEUMATIC PAINTER

MACHINE AT WORK.



AS USED AT MALVERN GAS-WORKS.

Machines have already been supplied to several of the largest Gas Companies, Engineering Works Manufacturers, Contractors, &c., &c.

Extract from a letter received from the Engineer to the Malvern Gas-Works: "I timed the Machine and found one Spray was executing work at the rate of 130 yards per hour; and upon putting a good man to work alongside, I found the Machine got over **at least ten times the work.**"

PNEUMATIC PAINTING MACHINE (1895) CORPORATION, Limited.

Offices and Showrooms: 86, CHARING CROSS ROAD, LONDON.

ALEX. C. HUMPHREYS, M.Inst.C.E. A. G. GLASGOW, M.E.

MESSRS. HUMPHREYS & GLASGOW

Have constructed their EUROPEAN type of

CARBURETTED WATER-GAS PLANT

At the following Gas-Works:—

Copenhagen	700,000 Cub. Ft.	Brighton	1,500,000 Cub. Ft.
Belfast	1,700,000 ,,	Preston	1,500,000 ,,
Glasgow	300,000 ,,	Southport	750,000 ,,
Brussels	700,000 ,,	Bath	1,000,000 ,,
Liverpool	3,500,000 ,,	New York	1,200,000 ,,
Tottenham	750,000 ,,	Newburgh, N.Y.	350,000 ,,
Santiago	400,000 ,,	Tottenham (Second Contract)	750,000 ,,
Swansea	750,000 ,,	St. Joseph, Mo.	750,000 ,,
		Brussels (Second Contract)	700,000 ,,

And have now under Contract:—

Belfast (Second Contract)	4,500,000 Cub. Ft.	Stockport	500,000 Cub. Ft.
Shanghai	225,000 ,,	Norwich	1,000,000 ,,
Winchester	200,000 ,,	Guildford	350,000 ,,
Hoylake	125,000 ,,	Syracuse, N.Y.	850,000 ,,
Manchester	3,000,000 ,,	Bordentown, N.J.	125,000 ,,
Holyoke, Mass.	600,000 ,,	Lea Bridge	350,000 ,,
Edinburgh	2,000,000 ,,	Newburgh, N.Y. (Second Contract)	250,000 ,,
Stockton-on-Tees	500,000 ,,	Coventry	600,000 ,,

In addition to which the previous Installations of The Gaslight and Coke Company under this System have a total capacity of 10,000,000 cubic feet per diem.

9, Victoria Street, London, S.W. — Telegrams: "EPISTOLARY, LONDON." — *United States Office, 64, Broadway, New York.*

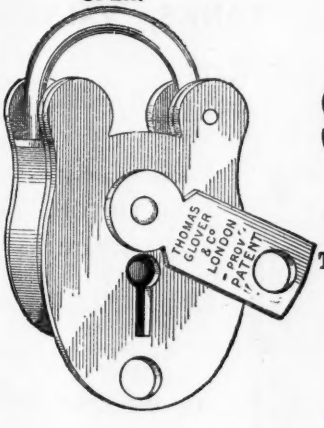
[ESTABLISHED 1844.] **ORIGINAL MAKERS.** [ESTABLISHED 1844.]

LONDON, 1851. NEW YORK, 1853. PARIS, 1855. LONDON, 1862. DUBLIN, 1865. PARIS, 1867.

THE SIX MEDALS AWARDED TO THOMAS GLOVER'S PATENT DRY GAS-METERS;

The latter being the Highest Award for Dry Gas-Meters at the Paris Exhibition, 1867. Since then we have not Exhibited FOR PRIZES.

OPEN.



THOMAS GLOVER & CO.'S

PATENT

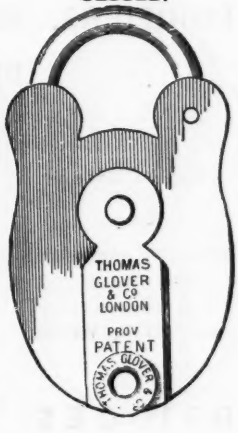
SECURE PADLOCK

Prevents Tampering with the

CASH-BOXES OF PREPAYMENT METERS.

The Padlock is Sealed by means of a Lead Eyelet, which is impressed with Company's private mark.
Eyelets easily fixed and removed by Company's Collector.

CLOSED.



Telegraphic Address: "GOTHIC LONDON." Telephone No. 6725.

THOMAS GLOVER & CO., LTD.,

DRY GAS-METER MANUFACTURERS,

214 to 222, ST. JOHN ST., CLERKENWELL GREEN, LONDON, E.C.

BRISTOL: 62, VICTORIA STREET. *Telegraphic Address: "GOTHIC."*

BIRMINGHAM: 1, OOZELLS STREET. *Telegraphic Address: "GOTHIC."*

MANCHESTER: 37, BLACKFRIARS STREET. *Telegraphic Address: "GOTHIC."*

JAMES MILNE & SON, LTD.,

GAS ENGINEERS,

MILTON HOUSE WORKS, EDINBURGH.

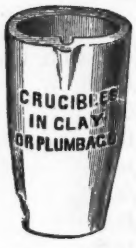
LONDON. — GLASGOW. — LEEDS.

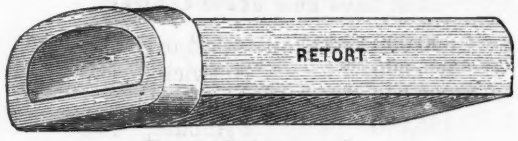
PHILADELPHIA EXHIBITION, 1876.

ALSO SILVER MEDAL, PARIS.

The Highest Award for Gas-Retorts and other Goods in Fire-Clay has been awarded to KING BROTHERS for their Goods made from their renowned Stourbridge Fire-Clay.

KING BROTHERS,





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STOURBRIDGE CLAYS,

Manufacturers of

Fire-Bricks, Tank Blocks, Glass-House Bricks and Pots, Gas-Retorts, Crucibles in Clay and Plumbago, Gas-Oven Bricks, Bricks for Regenerator Furnaces and Hot-Air Stoves.

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N.B.—Gas, Blast-Furnace, and Glass-House Bricks and Glass-House Pots always in Stock, or made on the Shortest Notice.

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MAKERS OF

GASHOLDERS & GAS PLANT,

PURIFIERS, SCRUBBERS, CONDENSERS, WASHERS, TANKS, VALVES, PIPES, LAMP PILLARS, RETORT-FITTINGS, ETC.

ALSO ALL KINDS OF

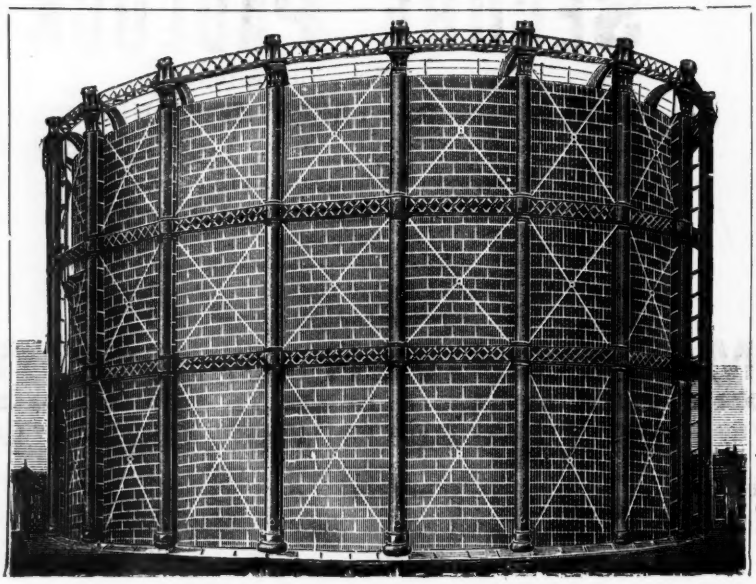
STRUCTURAL IRON

AND STEEL WORK.

BRIDGES,

ROOFS,

PIERS, ETC.



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GAS COAL.

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CONTRACTORS.
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JONAS DRAKE & SON

SOLE AGENTS FOR
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PATENT REGENERATIVE FURNACES
—FOR—
ENGLAND, WALES & ABROAD.
RETORT BENCHES ERECTED COMPLETE
WITH OR WITHOUT SPECIAL FURNACES.
RESULTS GUARANTEED.

OVENDEN HALIFAX

RETORT SETTERS.
FURNACE BUILDERS.
ETC. ETC.

Designs and Estimates on Application.

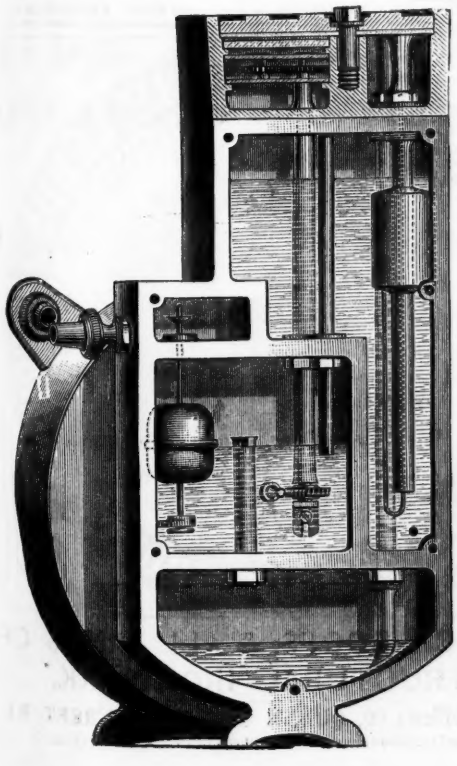
GASEOUS FIRING A SPECIALTY.

ALDER AND MACKAY,

MANUFACTURERS OF

IMPROVED WET AND DRY GAS-METERS

IN CAST-IRON AND TIN CASES OF THE HIGHEST EXCELLENCE.



Sole Makers of Green's Patent Underground Wet Gas-Meters for Street Lighting, &c., and Ogden's Patent Spindle Tube for Wet Gas-Meters.

GREEN'S PATENT
UNDERGROUND METER

Has been designed to obviate that which has hitherto prevented the general adoption of underground Meters—namely, their serious cost. No box is required; and the saving thus effected as compared with ordinary underground Meters, where either a box or meter-pillar is necessary, is fully one-half. The price of one for three lights is 28s.; and the other sizes are correspondingly cheap. When fixed, the only part of the Meter exposed to view measures 6½ inches by 3½ inches. By the Indicator with which the Meter is fitted, the Inspector can at once discern whether water is required; but as the Meter is of the compensating description, water will probably need only be supplied ONCE A YEAR. It is advisable to fill the Meter with a non-freezing liquid, which does not injure the fittings; and this can be supplied at about 1s. 3d. per gallon.

Prices and all Information on Application.

NEW GRANGE WORKS, EDINBURGH.

HIGHEST AWARDS given for our WET and DRY METERS at
Exhibitions held at GLASGOW, CALCUTTA, and EDINBURGH.

BOWENS' Ltd. Successors,
STOURBRIDGE.

MANUFACTURERS OF

BEST FIRE-BRICKS; INCLINED, HORIZONTAL, and SECTIONAL RETORTS; LUMPS, TILES, &c., of every description.

Established 1860.

OXIDE OF IRON.
NATURAL BOG ORE FROM OWN MINES.

Samples and Prices on application.

Wm. H. MÜLLER & CO.,
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HARPER & MOORES,
STOURBRIDGE.

MANUFACTURERS OF

BEST FIRE-BRICKS, GAS-RETORTS,

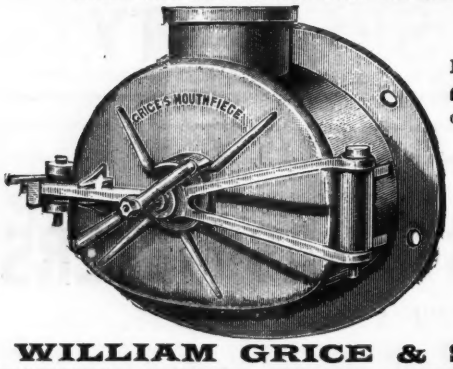
LUMPS, TILES, AND ALL ARTICLES IN FIRE-CLAY.

Proprietors of Best Glasshouse Pot, Crucible, and other Stourbridge Clays.

MANUFACTURERS OF GLASSHOUSE POTS AND CRUCIBLES OF EVERY KIND.

ESTABLISHED 1836.

GRICE'S SELF-SEALING MOUTHPIECE,
FITTED WITH WROUGHT-IRON FRONT AND SIDE LEVERS.



Patterns for Oval, ⌂, and Rounds, or all sized Retorts.

Catalogue and Price on application.

WILLIAM GRICE & SONS,
FAZELEY STREET WORKS, BIRMINGHAM.

JOSEPH CLIFF & SONS,
INCORPORATED IN
THE LEEDS FIRE-CLAY COMPANY, Ltd.,
WORTLEY, LEEDS.

LONDON OFFICES & DEPÔTS:
Baltic Wharf, Waterloo Bridge.
WHARVES NOS. 2 & 4, INSIDE G.N. GOODS YARD, KING'S CROSS, N.
LIVERPOOL:
16, Lightbody Street.
LEEDS:
Queen Street.

MACHINE-MADE RETORTS

Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

WILLIAM INGHAM & SONS,
Incorporated with the Leeds Fire-Clay Company, Ltd.,
WORTLEY FIRE-CLAY WORKS,
Near LEEDS,

Have confidence in drawing the special attention of GAS ENGINEERS to the following advantages of their Retorts:—

1. Smooth interior, preventing adhesion of Carbon.
2. They can be made in one piece up to 10 feet long.
3. Uniformity in thickness, ensuring equal Expansion and Contraction.

PATENT
MACHINE-MADE GAS-RETORTS.

THE THAMES BANK IRON CO.
UPPER GROUND STREET, LONDON, S.E.,

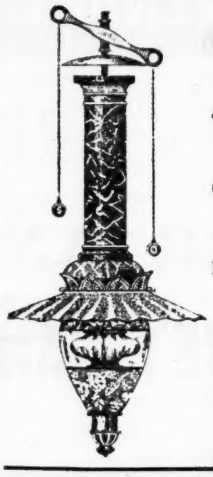
SUPPLY FROM STOCK

CAST-IRON RETORTS,
AND ALL KINDS OF GAS-WORKS APPARATUS.

SOCKET-PIPES FOR GAS OR WATER PURPOSES.
FLANGE PIPES FOR STEAM.
Sole Manufacturers of **LYON'S "PATENT" GAS-MAIN SYPHONS.**

AGENTS FOR
ATTERTON'S PATENT APPARATUS for CHARGING RETORTS.

The Climax of Regenerative Gas Lighting!!



THE
"VERTMARCHE"
A 280-CANDLE POWER PLAIN IRON LAMP,

CLASS A— 55/-

LIGHT for LIGHT
less than half the price of any other Regenerative Lamp.

Manufactured in England.

HENRY GREENE & SONS,
153 & 155, CANNON STREET, LONDON BRIDGE, E.C.

PARTICULARS AND PRICES FREE. AGENTS WANTED.

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CLAYTON, SON & Co LTD LEEDS.
ALL KINDS GAS PLANT
12,100,000 CUB FT CAPACITY.
COMPLETED IN 12 MONTHS
GASHOLDERS
OUR SPECIALITY
IT IS 300 FT DIAR. HAS SIX LIFTS, EACH 30 FT DEEP. HAS NO ROPES OR SPIRAL GUIDES.
MAKERS OF THE LARGEST GASHOLDER IN THE WORLD
HIGH CLASS BOILERS &c
ANTI-FREEZERS RETORT LIDS

GIRDERS, ROOFS, & ALL KINDS OF STRUCTURAL IRONWORK.

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Telegraphic Addresses: "GAS, LEEDS," "ECLAIRAGE, LONDON."

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IMPROVED

Sulphate of Ammonia Apparatus.

The most successful and approved Apparatus known up to the present time.

FOR REFERENCES, PARTICULARS, TESTIMONIALS, AND PRICES, APPLY TO

GODDARD, MASSEY, & WARNER,

ENGINEERS,

NOTTINGHAM.

The Apparatus has been supplied to the following Firms–

BURT BOULTON, & HAYWOOD, SILVERTOWN, and ELING.
CHANCE BROTHERS, OLDBURY (FOUR APPARATUS).
RUNCORN SOAP & ALKALI CO., Limited, RUNCORN.
NETHAM CHEMICAL CO., Limited, BRISTOL.
ANIMAL CHARCOAL CO., Limited SHADWELL.
WM. BUTLER & CO., BRISTOL.
KEMPSON & CO., Pye Bridge.

And to the following Gas Companies and Corporations—

ILKESTON.	BURY.	CHORLEY.
WIDNES.	BRIGHOUSE.	WHITEHAVEN.
HALIFAX.	MARKET HARBRO'	CHESTER.
ALTRINCHAM.	PRESCOT.	SOUTH SHIELDS.
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DUKINFIELD.	DARWEN.	BOURNEMOUTH.
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CHARGING OR COAL MEASURING TRUCKS.

FOUR CENTRE SIDE TIP WAGGON

SPECIALITIES—

LYON & DEIGHTON'S PATENT SCOOP FILLING WAGGONS,

Steel Coal and Coke Barrows, Steel Charging or Coal Measuring Waggons, Railways, Points, and Crossings, Patent Turntables (requiring no Lubrication), Charging Scoops, Rake-Heads, Revolving Screens, Hoppers, &c., Cast-Iron Smith's Hearths, Steel Side Tipping Waggon, End Tip Waggons, or Universal Tip Waggons. Lyon's Patent "Cradle" Side, End, or Universal Tip Waggons for easily working heavy loads.

C. W. LYON, Engineer, Thornhill-Lees, Dewsbury.

PETTIGREW'S PATENT

Sulphate of Ammonia Plant

ON THE CONTINUOUS SYSTEM

Is the newest in the Market, and is the outcome of practical experience in Sulphate Making.

Old Systems easily and cheaply converted.

ANY SIZE ERECTED COMPLETE AT HOME OR ABROAD.

Write for Particulars, Testimonials, and References to

GEO. PETTIGREW & Co.,

GAS AND CHEMICAL ENGINEERS,

MIDDLESBROUGH-ON-TEES.

PELOUZE & AUDOUIN'S

PATENT MECHANICAL CONDENSER.

Over 292,000,000 Cubic Feet of Gas per Day is passing through about 550 of these Machines.

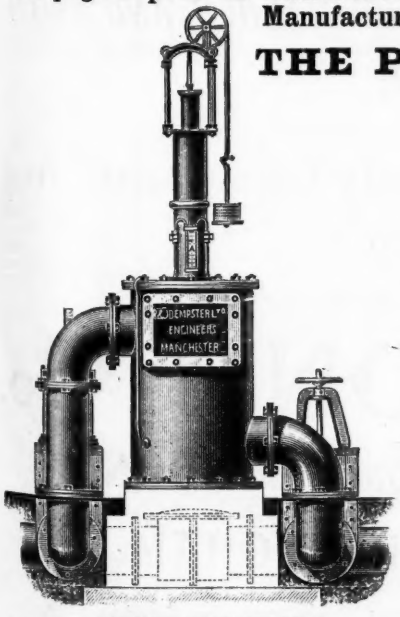
Messrs. R. & J. DEMPSTER, Limited,

HAVE PLEASURE IN ANNOUNCING THAT THEY HAVE MADE ARRANGEMENTS WITH THE

Compagnie pour la Fabrication des Compteurs et Materiel d'Usines a Gaz, of Paris, to Manufacture and Sell in this Country and the Colonies,

THE PELOUZE & AUDOUIN CONDENSER,

According to P. AUDOUIN'S LATEST PATENTS.



FRONT ELEVATION.

This Apparatus is in very general use in most of the Gas-Works on the Continent and in America; over **550** being in use in different parts of the World for condensing and arresting all Tar Particles and Vapours from the Gases from Coal, Oil, and Wood.

The large number in use is sufficient proof of its utility. By the almost complete elimination of Tar, which is effected to the extent of 99·7 per cent., it facilitates Purification in the Purifiers, by preventing the clogging or obstruction of the Purifying Materials, which, in consequence, last much longer; thus effecting a Saving both in Materials and Labour.

So effective is this Apparatus that a piece of white paper placed over a Test-Tap on the Inlet of the Machine is immediately covered with Tar, whilst on the Outlet the white paper remains perfectly clean.

The Machines are made in the following sizes, for Works producing per 24 hours—

	Cubic Feet.		Cubic Feet.
0	35,000	5	500,000
1	70,000	6	700,000
2	140,000	7	1,240,000
3	210,000	8	1,750,000
4	350,000	For larger Makes, two Machines are recommended.	

For Prices and further Particulars, apply to the Sole Makers—

Telegraphic Address: "SCRUBBER, MANCHESTER." **R. & J. Dempster, Ld., Gas Plant Works, Newton Heath, Manchester.** Nat. Telephone Nos. 2296 & 54.

PARKINSON'S

PREPAYMENT GAS-METERS.

Many Thousands in use in all parts of the Country.

COMBINES SIMPLICITY WITH STRENGTH.

ACCURACY WITH COMPACTNESS.

Adapted for use with PENNIES, SHILLINGS, or other English or Foreign Coins.

PRICE-CHANGING EFFECTED IN THE SIMPLEST MANNER AND WITH ABSOLUTE EXACTITUDE.

Coin Mechanism accessible, and easily taken apart in case of ill-usage, &c.

W. PARKINSON & Co.

Cottage Lane Works, City Road, LONDON.

Bell Barn Road Works, BIRMINGHAM.

Telegraphic Addresses { "INDEX, LONDON." / "GAS METERS, BIRMINGHAM." }

Telephone Numbers (National) { London 7778. / Birmingham 1101. }

[See also Advt. p. 836.

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